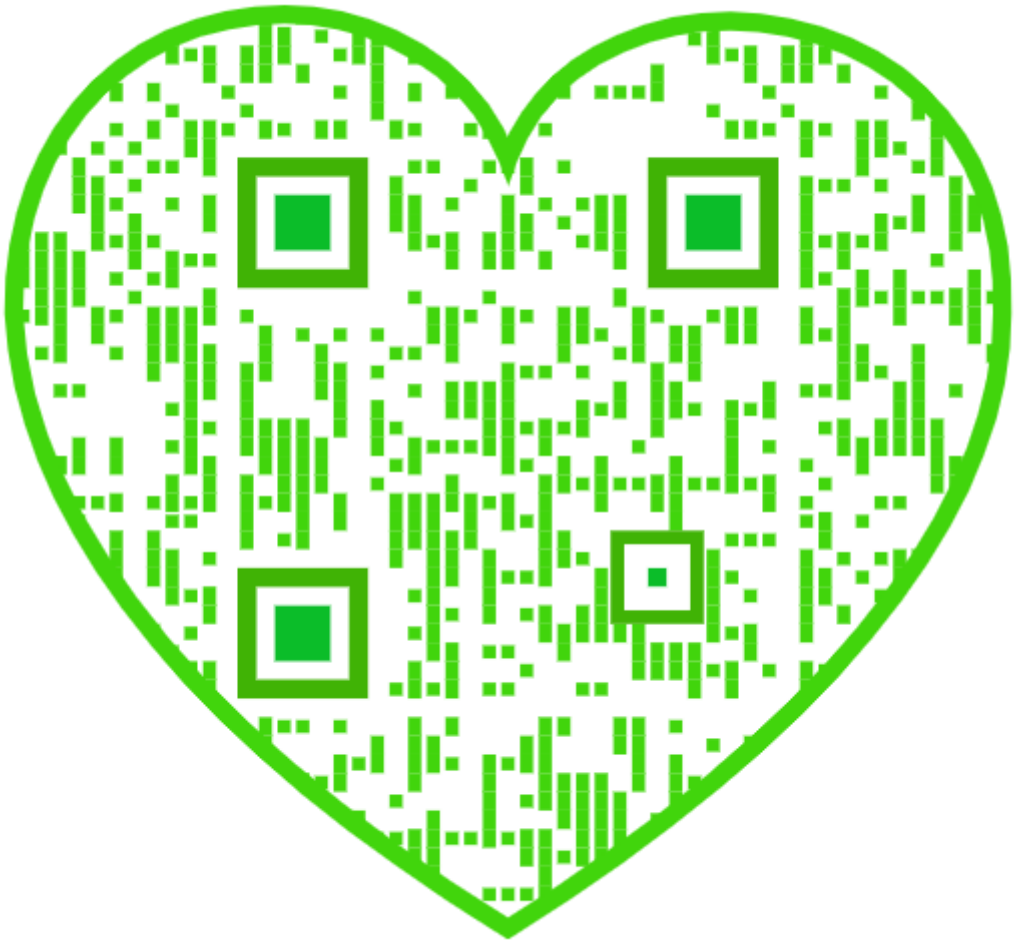

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BEES

AND

HONEY

OR, THE

Management of an Apiary

FOR

PLEASURE AND PROFIT.

BY

THOMAS G. NEWMAN

ILLUSTRATED.

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INTRODUCTION.

It has been computed that in our World, the different species of living animals number over a quarter of a million. Among this vast concourse of life, we find much food for thought and meditation, but for instructive lessons none can rival the marvelous transformations that insect life undergoes in its processes of development!

The repulsive maggot of to-day, may to-morrow be the active little fly, visiting leaf and flower, in merry and sportive mood! The repugnant caterpillar of to-day, may to-morrow, as a chrysalis, be decked with green and gold, awaiting its speedy transformation to the butterfly, of brilliant tints and gorgeous beauty.

Such transformations give us a faint idea of the glorious state of existence that, we are assured, awaits humanity, after its passage beyond the present state of existence! We are informed that "its glories and pleasures untold" will be fully realized by the pure and the good—yet of its realization we can have no adequate conception! While in the present state of development, like the chrysalis, awaiting the next transformation, we may but inquire—"What shall it be to be there?" For—

> "Dreams cannot picture a world so fair,
> Sorrow and death may not enter there;
> Time cannot breathe on its fadeless bloom—
> Far beyond the clouds, and beyond the tomb—
> It is there! It is there!!"

This is not a whit more wonderful than are the transformations from the egg to the tiny larva, from the larva to the pupa, and from the pupa to the fully developed Honey Bee, with its wondrous instincts and marvelous habits! The student never ceases to wonder and admire, as he turns over leaf after leaf of "the book of nature," devoted to this interesting insect. Indeed, there is a fascination about the Apiary, that is truly indescribable; but even that, richly rewards the apiarist for all the time and labor bestowed upon it. Every scientific Bee-keeper *is* an enthusiast. The wonderful economy of the Bee Hive, from its very nature, presents to the thoughtful student, both admiration and delight at every step!

A single bee, with all its industry, energy, and the innumerable journeys it performs, will collect only about a tea-spoonful of honey during one season—and yet more than one hundred pounds of honey is often taken from one hive!

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Does not the contemplation of this fact teach us a profitable lesson of what great results may arise from persevering and associated labor?

When we view the skill exhibited in the building of the beautiful comb—so true in form, so wonderfully systematic in construction, and all completed by a crowd of bees in a dark hive—and often at night, without the aid of sun, moon or stars—we are amazed at the skill of these wonderful architects!

In fructifying the flowers, too, bees present us with a field of study so extensive that we dare not enter, further than to say that but for their oft-repeated visits, many a beautiful flower would in a short time cease to bloom—aye, and also to live! Many plants absolutely require the visits of bees or other insects to remove their pollen-masses, and thus to fertilize them. Hence, Darwin wisely remarks, when speaking of clover and heart's-ease: "No bees, no seed; no seed, no increase of the flower. The more visits from the bees, the more seeds from the flower; the more seeds from the flower, the more flowers from the seeds." Darwin mentions the following experiment: "Twenty heads of white clover, visited by bees, produced 2,990 seeds; while twenty heads so protected that bees could not visit them, produced *not one seed*."

Thus is infinite Wisdom displayed by Nature on every hand! Nothing is created in vain; each has its proper sphere, and each its appropriate work to perform. We admire "the grand harmony of design," and in meditative mood we are soon

"Lost in wonder, love and praise!"

Then we may seem to hear the merry hum of myriads of insects, mingling with the joyous song of thousands of beautiful birds adoring their Creator in Matin Song—all Nature joining in the chorus of praise—singing—

"The hand that made us is divine!"

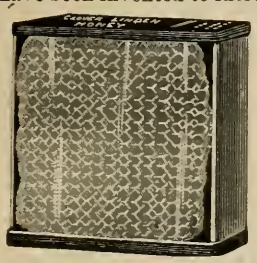
As the song ascends to Heaven, billions of plants, and shrubs, and trees, and flowers burst into bloom, and bid their sweet perfume to unite with Nature's Chorus, and present a "thank-offering" to the Great Father of all, "who openeth His hand, and satisfieth the desire of every living thing."

WHAT IS HONEY?

It is a vegetable product, not made, but gathered from flowers where it is secreted according to the rules of Nature's laboratory. Each flower yields honey of its own peculiar flavor, which is generally easily recognized. No article for human consumption can be more delicious than Honey, and none is more beneficial to the human system. Honey is food in one of its most concentrated forms.

Honey in the Comb.

Within the past few years many improved methods and appliances have been invented to increase the production of Comb Honey.



Honey is now produced by the bees, in small sectional-boxes (see engraving), with the cells capped, ready to grace the table and tempt the palate of every lover of that delicious article—Comb Honey.

These "sections" of honey are taken from the hive just as finished by the bees, crated and placed upon the market.

An inventive genius lately started the story that combs were being made of paraffine, filled with glucose, and sold for comb honey. That is a *falsehood*, admitted by its author when proof was demanded.

Honey Extracted from the Comb.

Pure Extracted Honey is obtained by shaving off the delicate cappings of the cells, putting the combs into the little revolving basket of a Honey Extractor (see engraving), and then by revolving the basket containing the comb, by means of the crank, the honey is thrown out by centrifugal force, runs down the sides of the Can, and drawn off and put into jars, pails, or any desirable receptacle. Extracted Honey is the pure liquid—minus the comb.

Some ask: "How can Extracted Honey be sold cheaper than that in the Comb—if it is pure?" We reply, Because the comb is of more value than the honey; for it takes from 15 to 20 lbs. of honey to produce one pound of comb. By improved methods we compel the bees to build straight combs in frames; these can be removed in an instant, the bees brushed off, the honey extracted, and the combs returned to the hive to be again filled by the bees.

Granulated or Candied Honey.

Almost all pure honey will granulate when exposed for some time to light and cold. The granulated state is one evidence of purity.

Granulated honey can be reduced to its liquid state in a few moments by placing the can or jar in warm water. When thus liquefied, it so remains for a time, but will again candy.

Northern honey candies sooner than Southern.

What is Strained Honey?

"Strained Honey" which will not granulate or candy, is nearly always glucose, with enough honey to flavor it, and thus deceive.

Consumers help to impose upon themselves by the false idea that pure honey will not granulate; they desire liquid honey, and dealers will supply it. Much of that remaining liquid, is a very inferior article, composed largely of glucose, surrounding a piece of comb.

Effect of Honey on the Human System.

The masses do not realize the value of honey from a hygienic stand-point, else it would have more than kept pace with sugar as an article of human consumption.

Dr. Vance makes such very excellent remarks on this subject that we can do no better than to give them entire: "Honey is a physiological sweet; in other words, its constituents are such that it is absorbed into the blood without undergoing chemical change. Such is not the fact with regard to sugar. Sugar is indigestible, or rather not as susceptible of absorption and assimilation as honey, but it requires the action of the gastric juice to split or invert its elements, the muriatic acid element of the gastric juice being the chief agent in this chemical transportation. This change produces what is termed in chemistry dextrose and lævulose. I presume this explanation does not convey a very clear or definite idea of the nature of these products, for the names applied only indicate how they affect polarized light. After this change occurs, absorption takes place. If in any way it is hindered, or, on account of an excess of sugar above the capacity of the gastric juice to transform, there remains a residue, the result is decomposition into elements that irritate and inflame the mucus membrane of the intestinal canal, producing a list of ailments too numerous to mention here. Think of the legions of little ones who have been the victims of their universal fondness for sweets, and who so frequently suffer from the gastric troubles which are, in a large degree, the result of sugar indigestion. How many, many children have perished from eating candy!

"The importance of sugar as an element of food may be inferred from the large proportion of the elements of our food which is transformed by the action of the digestive organs, into the constituents of sugar. Consider the proportions of bread, potatoes and vegetables that we consume daily, all of which must undergo this saccharine change before they are suitable to be appropriated by the human system; it may give an approximate idea of the amount of these elements that are required to nourish our bodies.

"If, therefore, the saccharine comprises so large a part of the elements of our food, does it not become an important question as to what form of sweet is the most appropriate and healthful for the nutrition of the human body? For the reasons I shall hereafter enumerate, it seems to me that you will agree with me that honey is the most important and the most healthful, because it is absorbed into the system without change, and, because, unlike sugars, it does not easily undergo fermentation. The formic acid which is an ingredient of honey, prevents chemical change and the morbid processes arising from decomposition of sugar.

"Let me repeat the points of difference in ordinary sugars and syrups, and their comparative inferiority to honey as a saccharine food: Honey is an inverted sugar consisting of lævulose (fruit-sugar) and dextrose (starch-sugar) and readily absorbed into the system without being acted upon by the gastric juice, converting, as it is expressed in chemical language, inverting it into dextrose and lævulose, before it is susceptible of absorption and assimilation in the blood. When thus acted upon by the digestive organs, it is assimilable, but in case of weakness of digestion, this action does not occur, and decomposition is sure to follow. Honey is not only a delicious form of sweet, but is a very healthful and nutritious form of food. It aids the natural functions of the alimentary canal. It is recommended by those who have thus used it, as a refreshing drink, diluted with water in the proportion of from 2 to 5 per cent."

Pure honey should always be freely used in every family—Honey eaten upon wheat bread is very beneficial to health.

———:o:———

Bees and Fruit.—Bees do not puncture Fruit, as some assert. When fruit is over-ripe, or the skins of grapes are bursted, the bees will sometimes appropriate the juice, greatly to their detriment, when no honey can be gathered. Such juices soon sour in the hives, and become unfit for the food of bees in winter—and disease and death is the result. Many bee-keepers also raise fruit, and their testimony universally agrees with the statement here made.

On the other hand, bees are the best friends of the growers of small fruit. They fructify the flowers, and cause the fruit to mature. Were it not for the bees, and other insects, to fertilize the flowers, the trees and vines would cease to bear fruit, and become useless.

In a certain town in New England, so strong was the belief that bees injured the fruit, that an ordinance was passed, obliging the bee-keepers to remove their bees to another locality. After a year or two, the fruit-growers decided to have the bees brought back, because so little fruit matured upon the trees.

Honey Cakes.—To 3 eggs well beaten, add 1½ cups of extracted honey, 1 cup sour cream or butter-milk, ½ teaspoonful of soda, and 3 cups of flour, to which was added 1 tea-spoonful of baking powder. Bake in jell pans and put together with lemon paste made as follows: In the juice of 1 lemon dissolve 1 table-spoonful of corn-starch, pour on it ½ a cup of boiling water, ¼ cup of extracted honey, and one table-spoonful of sugar.

Honey Fruit Cake. — Take 1¼ cups honey ⅔ cup butter, ½ cup of sweet milk, 3 eggs well beaten, 3 cups of flour, 2 tea-spoonfuls baking powder 2 cups raisins, 1 tea-spoonful each of cloves and cinnamon.

Honey Label Paste. — Stir wheat flour in cold water and leave no lumps—pour on boiling water, and stir it until it boils. Use hot or cold. When cold, resembles hasty pudding.

Uses for Honey.—In all ages honey has been used for many purposes. The Ancient Britons used it to make mead, and this drink continued to be much used hundreds of years after them. When malt liquors became popular, and when sugar was introduced, then the use of honey decreased, but lately it has increased materially.

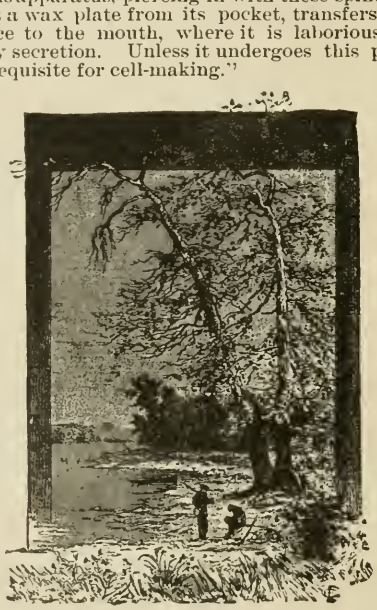
Honey is largely used in the manufacture of honey chocolate-creams and honey chocolate-tablets. There is a delicious taste of the honey in these articles, but they are so judiciously blended with the other materials that they are not too sweet.

Honey is also now generally used by the confectioners in the place of sugar in many kinds of lozenges, cough drops and other sweet-meats. Glycerine and honey jujubes for the throat; corn and honey food; herbal tablets, etc., are only a few of the many things which might be mentioned. In the toilet, it is used in soap and dentifrice.

There are many persons who are not allowed to use sugar at all; to these honey comes as a boon. It is a curious thing to note that even the angler now uses honey, and natural honey fish-bait is put down in the list of necessaries for the modern complete angler.

BEESWAX AND HONEY.

How Beeswax is Made by the Bees, is described thus: "It is no mere extraneous substance which needs only to be collected for use; it is a bit of individual organic home manufacture. If you examine the under surface of a cell-building worker-bee, you will find beneath the abdomen four pairs of white plates projecting from as many pockets in the incasing rings of this part of the body. These are the wax plates, made from the life-blood of the worker. Examine now with a lens one of the hinder legs. You will find that the stoutest joints are very square-shouldered at the hinge, and that the hinge is well over to one side, so that the shoulders form a pair of jaws, which open when the limb is bent, and close when it is straightened. The upper jaw has a row of spines which bite on a plate on the lower jaw. With this apparatus, piercing in with these spines, the worker-bee withdraws a wax plate from its pocket, transfers it to the front legs, and thence to the mouth, where it is laboriously masticated with a salivary secretion. Unless it undergoes this process it lacks the ductility requisite for cell-making."



Honey and Glucose.—The former is very different from the glucose of commerce.

Honey is a mixture very nearly in equal parts of dextrose and laculose. The dextrose is what granulates—is the same kind of sugar as is found dried in raisins, and is about ⅓ as sweet as cane sugar. The laculose will not candy, and is sweeter than cane sugar.

Glucose from starch is a mixture generally of one part of dextrose and three parts of dextrine — a gummy substance used in stiffening calicoes and gumming postage stamps. Dextrine is never found in pure honey. A test of dextrine is the solution of sub-acetate of lead, or Goulard's water, found at any drug store.—This precipitates the dextrine in any mixture as a thick white curd, which floats in the liquid.

The same solution put into honey does not change its color. This simple test is very striking, and always reliable.

To Detect Beeswax Adulteration.—When beeswax is chewed, says an expert, it should have no disagreeable taste, and must not stick to the teeth. In the adulterated wax, the nature of the foreign material can generally be detected by the taste; the addition of fat can generally be readily detected. If it sticks to the teeth, the presence of resin may be assumed. A simple method of detecting the presence of fat in wax consists in melting it, and placing a drop on a piece of woolen cloth. After it is perfectly cold and solidified, pour on a few drops of 90 per cent. of alcohol, and rub the cloth between the hands. The wax will be converted into dust, and will easily separate from the cloth if it contains no fat, and will leave no stain; when it contains fat, it will leave grease-spots.

HONEY POT-POURRI.

Hum-sweet-hum—that of the honey-bee.

To purify beeswax, melt and cool slowly over a body of water.

It is at a "quilting-bee" where you hear the "stinging" remarks.

Put honey in your tea to sweeten it, and if you are troubled with *gravel*, it will cure it.

The first bees brought to America were landed in Boston, Mass., in 1670, by some Englishman.

A tea-spoonful of warm honey taken every 15 minutes has a surprising effect on catarrh.

Diphtheria and sore throat in the early stages can be cured by honey taken warm, or in food.

Onion juice instantly applied will allay the pain caused by the stings of bees or other insects.

Honey is one of the purest sweets used, and when its healthfulness is considered, it is the cheapest.

What is the difference between a honey-comb and a honey-moon? The one is a lot of small cells, and the other is one great sell?

Substitute Honey for sugar in the Recipes given in your cook-book, and you will vastly improve the flavor.

What is the difference between a bee and a donkey? One gets the honey, and the other the whacks (wax).

If a boy wishes to know whether the bees see or not—let him put his finger into the entrance of a bee-hive!

The constant use of honey is without the slightest danger, even during an epidemic of cholera. It cures constipation.

A school-teacher asked a boy to pronounce s-t-i-n-g-y. Before doing so he asked whether it was to be applied to a man or a bee.

Public speakers should freely use honey. The formic acid which it contains cures affections of the mouth, throat, lungs and chest.

Doctors use honey for many purposes, and some doctors are good bee-keepers; and the purity of their medicines may be guaranteed.

The pain and swelling consequent upon the stinging of a bee, will leave if bathed with equal parts of the tincture of aconite, laudanum and chloroform.

Because cheap cane sugars have been taken into the stomach in unreasonable quantity, the liver has been unable to transform them, resulting in disordering both organs.

Bread broken up in a bowl, covered first with honey and then with a thick cream, and eaten, will permeate the organs of taste, and give the whole system a feeling of ecstasy and delight. Cream neutralizes any ill effects the sweetness may produce in the human stomach.

Children would rather eat bread and honey than bread and butter; one pound of honey will reach as far as two pounds of butter, and it is far more healthy and pleasant to the taste. It always remains good, while butter becomes rancid, and often produces cramp in the stomach, eructations, sourness, vomiting and diarrhea.

The magnitude of the industry of "bees and houey" can be estimated by the fact that there are in North America 300,000 who keep bees, and if these apiaries average but 10 colonies each, the number of colonies reaches 3,000,000, and if these produce but the very small average of 30 pounds of honey per colony, then the product is 90,000,000 of pounds of honey, worth $10,000,000 and if each colony of bees yields but one pound of beeswax yearly, then the wax product at 20 cents per pound, is worth $600,000.

ITALIAN BEES.

QUEEN.

WORKER.

DRONE.

NATURAL HISTORY OF THE HONEY BEE.

INTRODUCTION.

Every apiarist should be well informed, not only on the habits, but also on the Natural History of the Honey Bee.

Man's primeval state, no doubt, absolutely demanded honey—therefore to have neglected to produce such a creature as the Honey Bee, so essential to the comfort of man, "for whom all things were made," would have been totally discordant with the well-known principles of universal and Divine benevolence. Could any song of birds in Eden's enchanting bower surpass the mellifluous hum of the busy Bee? Could any sportive gambol, circling flight, sudden dart, or graceful curve of bird on the wing, equal the grace and beauty, the action and the science of her aerial sports or daily duties? Could the combined aroma and symmetrical form of the thousands of "the flowers of Paradise" compare with the sweetness of her honey or the garniture of her store house? Could any portion of "the garden," which Adam was directed to "dress and keep," present greater attraction, or have stronger claims upon his protection and care?

While Honey was "from the beginning" among the first of sweet things, and the sweetest of first things, given by the Creator to man,—sugar is, separated from its source and prepared for use by the hand of man, but of modern birth!—For thousands of years Honey was man's only sweet, and source of nourishment,—but only for a short time has sugar had its partial sway—and that alone in modern times. The former was the creation and gift of God! The latter is the invention of man!

No historian has been able to transmit to our day, a

description of the rude home that Noah provided for the bees that he carried into the ark, nor tell us if Abraham's bees were kept in log-gums or box hives, but it *is* recorded that the land where Abraham dwelt—Canaan—was one "flowing with milk and honey;" and when the old Patriarch, because of the famine that prevailed there, sent his sons to Egypt to buy corn, he sent as a present to the Egyptian ruler some of Canaan's famous honey.—Gen. 43 : 11.

We may well conclude that Canaan's honey was then as famous as in subsequent ages was the honey from Mount Hymettus, in Greece.

The earliest mention of honey as an article of commerce, is, that the Jews were engaged in trading it at Tyre, that old and honored mart of trade in Phœnicia.—Ezek. 27 : 17.

Sirach, who lived about the time of the re-building of the Temple at Jerusalem, speaking of the necessaries of life, mentions honey, with flour and milk.

The Persians, Grecians and Romans, used honey quite extensively as an article of diet ; they also used it largely in *preparing* their food, and by it, most of their beverages were sweetened.

Ancient Sages, among whom were Homer, Herodotus, Cato, Aristotle, Varro, Virgil, Pliny and Columella, composed poems extolling the activity, skill and economy of bees, and in more modern times, among such authors have been Swammerdam, a German naturalist ; Maraldi, an Italian mathematician ; Schirach, a Saxon priest ; Réaumur, inventor of a themometer ; Bonnet, a Swiss entomologist ; Dr. John Hunter ; and Francis Huber, who, though totally blind, was noted for his many minute observations, by the aid of his assistant, Burnens, which caused quite a revolution in ancient theories concerning the Honey Bee. He was also assisted by Mdle. Jurine, who, by delicate microscopic examinations, rendered important service not only to Huber, but also to future generations.

But space forbids us to enumerate all the apiarists of the present age—prominent among whom we may mention Dzierzon, Von Berlepsch, Leuckart, Von Siebold, Sir John Lubbock, the Rev. L. L. Langstroth, Samuel Wagner, M. Quinby, Adam Grimm, J. S. Harbison, Capt. J. E. Hether-

ington, Professor A. J. Cook, and a mighty host of others, who, through faith in scientific research and devotion to experiments and manipulations, have wrought wonders with their Bees. "Pulling down the strong-holds" of old-fogy opposition, they "waxed valiant in fight" against all forms of ignorant and fossilized theories, consigning them to a burial with the fallacies of past ages—and, as if by magic wand, they have bidden modern ideas and scientific management of the Apiary to "*arise and shine*," sending benign influences to the very ends of the earth!

THE RACES OF BEES.

Of the different races of the Honey Bee, the German or black bee is the most numerous, though it is not older than the Italians, which were known to the ancients several hundred years before the Christian era, and are mentioned by Aristotle and Virgil. The Egyptian, Carniolan, Cyprian and Javan bees are but little known in this country. The Italian being the favorite because of its docility, activity and captivating beauty.

A COLONY OF BEES.

In its usual working condition, a colony of bees presents a scene of the most lively interest, not only to the naturalist, but also to every curious observer. Such a colony will contain a fertile Queen, thirty to forty thousand workers, and in some seasons, a few hundreds of drones.

THE QUEEN.

The Mother Bee, as she is called in many countries, especially in Italy, is the only perfect female in the Colony, and is the mother of it. Her only duty is to lay the eggs for the propagation of the species. She is a little larger around the body than the Worker, but not as large as the Drone.—Her body is longer than the Worker, but her wings are only about two-thirds of the length of the body, her abdomen gradually tapering to a point. She has a sting, but uses it only upon royalty.

The Queen usually leaves the hive only when accompanying a swarm, and when a few days old, to meet the drones,

for the purpose of becoming fertile. Once becoming such she is so for life, though she often lives three or four years. On her return to the hive, after meeting the Drones, if she has been fecundated, the male organs may be seen attached

FIG. 1.—*The Queen Bee, magnified.*

to her abdomen. In about two days after thus mating with the Drone she will commence to lay eggs, and she is capable of laying two thousand, or more, eggs per day.

Instinct teaches the Workers the necessity of having a Queen that is prolific, and should she become barren from

FIG. 2.—*Head of Queen, magnified.*

any cause, or be lost, they immediately prepare to raise another to take her place. This they do by building Queen cells, and if, when these are about one-half completed, the Queen has not deposited eggs in any of them, they take

eggs from worker cells and supply them. By feeding the embryo Queen with royal jelly, the egg that would have produced a Worker, had it remained in a Worker cell, becomes a Queen.

The Ovaries of the Queen, occupying a large portion of the abdomen, will be found to be two pear-shaped bodies, composed of 160 to 180 minute tubes, the tubes being bound together by enveloping air vessels. These are the ovaries, of which a highly magnified view is here given.

FIG. 3.—*The Ovaries of the Queen.*

The germs of the eggs originate in the upper ends of the tubes which compose the ovary, and the eggs develop in their onward passage, so that at the time of the busy laying season. each one of the tubes will contain, at its lower end, one or more mature eggs, with several others in a less developed state following them. These tubes terminate on each side in the oviduct, through which the egg passes into the vagina ; and, in the cut, an egg will be seen in the oviduct, on the right. (Fig. 3). A globular sac will be noted, attached to the main oviduct by a short, tubular stem.

A French naturalist, M. Audouin, first discovered the true

character of this sac as the spermatheca, which contains the male semen ; and Prof. Leuckart computes its size as sufficient to contain, probably, twenty-five millions of seminal filaments. It seems hardly possible that so large a number should ever be found in the spermatheca, as it would require nearly twenty years to exhaust the supply, if the queen should lay daily 2000 eggs, 365 days in the year, and each egg be impregnated. Each egg which receives one of the seminal filaments in passing, will produce a worker or queen, while an unimpregnated egg will produce only a drone. The spermatheca of an unfecundated queen contains only a transparent liquid with no seminal filaments, and the eggs of such a queen produce only drones.

The Queen usually lays from February to October, but early in the spring she lays sparingly. When fruit and flowers bloom, and the bees are getting honey and pollen, she lays more rapidly.

THE DRONES.

These are non-producers, and live on the toil and industry of others. They are the males, and have no sting—neither

FIG. 4.—*The Drone Bee, magnified.*

have they any means of gathering honey or secreting wax, or doing any work that is even necessary to their own support, or the common good of the colony.

The Drones are shorter, thicker and more bulky than the Queen, and their wings reach the entire length of their body. They are much larger and clumsier than the Workers, and are covered with short but fine hair. Their

buzzing when on the wing is much louder and differs from the others. Their only use is to serve the Queen when on her "bridal trip."

Not more than one in a thousand is ever privileged to perform that duty, but as the Queen's life is very valuable, and the dangers surrounding her flight are numerous, it is necessary to have a sufficient number of them, in order that her absence from the hive may not be protracted. After mating, she returns to the hive a fertile Queen for life.

The Drone in the act of copulation loses his life, dying instantly. At the approach of the swarming season they are

FIG. 5.—*Head of Drone, magnified.*

reared to fertilize the young Queens; after that is accomplished, they are mercilessly destroyed by the Workers.

Should a colony lose its Queen, the Drones will be retained later; instinct teaching them that without the Drone, the young Queen would remain unfertilized, and the colony soon become extinct.

THE WORKERS.

These are undeveloped females, and they do all the work that is done in the hive. They secrete the wax, build the comb, gather the pollen for the young, and honey for all; feed and rear the brood, and fight all the battles necessary to defend the colony.

Of the three kinds of bees, these are the smallest, but constitute the great mass of the population. They possess

the whole ruling power of the colony and regulate its economy.

The workers are provided with a sac or honey-bag; there is a small cavity on their posterior legs, (Fig. 43, A.) in which they store the pollen of flowers in very small lumps, being

FIG. 6.—*The Worker Bee, magnified.*

the most convenient form in which to carry it home. They are also provided with a sting, which they use only for defense.

They gather honey, which is a secretion in many flowers—pollen, which is the farina of various plants, and which is largely used in forming bee-bread, and also propolis or bee-

FIG. 7.—*Head of Worker, magnified.*

glue, a resinous substance that is used in fastening the combs to the sides of hives, and to fill cracks or open places.

Many persons entertain the idea that the Worker bees live many years. Their conclusion is drawn from the fact that colonies inhabit the same hive for a long period; but the natural life of the Worker honey-bee does not exceed six

months, and from recent experiments it is ascertained that it does not exceed six or eight weeks in the height of the honey season. Those reared in the fall, having little out-door work to perform, will live till the spring. None of them die of

FIG. 8.—*Anterior Leg of Worker, magnified.*

old age, but the majority work themselves to death, and many are killed through other causes.

BROOD.

The egg is laid by the Queen, in the bottom of the cell; in three days it hatches into a small, white worm, called larva, which being fed by the bees, increases rapidly in size; when this larva nearly fills the cell, it is closed up by the bees.

FIG. 9.—*Eggs and Brood.*

The time usually taken for this process is eight days for the Worker or Queen, and 9½ days for the Drone.

The Workers will develop from the egg in 21 days; gathering honey from about 16 days after emerging from the cell. The Drones will hatch in 24 days, and if the weather is propitious they will "fly" in a few days after. The Queens

mature in 16 days, and are able to fly in a few hours after emerging from the cell.

Until the 17th day the workers seem only to be fit for the work of the hive. Before that age they seldom leave the hive—their labors being confined to the building of the comb, nursing the brood, feeding the larvæ, capping brood and honey cells, &c.

PRODUCTION OF WAX AND COMB.

This subject is an intensely interesting study. Before the time of Huber, it was generally supposed that wax was made from bee-bread; but Huber fully demonstrated that bees could construct comb from honey, without the aid of bee-bread. But, oxygen, being the support of animal heat, *is essential* to bees while building comb, because an extraordinary amount of heat must be generated, to enable them to soften the wax and mould it into such delicate forms.

We herewith present a cut of the under surface of the Bee, showing the wax formation between the segments:

FIG. 10.—*Under surface of Worker, showing Wax in Segments.*

Dr. Dönhoff states that in new comb the thickness of the sides of the cells is but the 180th part of an inch! Such delicate work is hardly conceivable; and yet, bees often make it in the dark, on cool, cloudy days, or in the night—appearing never to rest.

Prof. Duncan, professor of Geology in King's College,

London, in his work on the "Transformation of Insects," remarks as follows on this interesting subject:

"The production of wax is one of the most remarkable physiological phenomena of the organization of these *Hymenoptera*. It was generally thought, formerly, that the bees disgorged their wax from the mouth, and Réaumur certainly held this opinion; but John Hunter discovered the manner in which the wax was formed; and it is now evident that the bees carry within themselves this important building material. The segments of the abdomen of bees overlap from before backwards, but when the margin of one is lifted up, two broad and smooth surfaces will be noticed on the uncovered surface of the next wing; these surfaces maintain during one part of the year two thin, white, and almost transparent laminæ, which are really composed of wax. The wax is really secreted by some small glands which are within the abdomen, and it transludes through the soft and smooth integument between the rings or segments. It would appear that the sugary matters which are sucked and digested by the bees are to a great extent transformed into wax, which is to all intents and purposes a sort of fat."

A writer in *Scribner's Monthly* thus describes the manner of comb building in a new swarm:

"When a swarm of bees is about to leave its old home and seek another, each bee fills itself with honey. After entering their new home, the gorged bees suspend themselves in festoons, hanging from the top of the hive. They hang motionless for about 24 hours. During this time the honey has been digested and converted into a peculiar animal oil, which collects itself in scales or laminæ beneath the abdominal rings. This is the wax. One of the workers, called the founder, then draws from its own body, by means of its clawed foot, a scale of wax. This it breaks down and crumbles, and works with its mouth and mandibles till it becomes pliable, and it then issues from the mouth in the form of a long, narrow ribbon, made white and soft by an admixture of saliva from the tongue. Meanwhile the other bees are making ready their material in the same way. On the ceiling of the hive an inverted, solid arch of wax is built, and from this the first foundation cells are excavated, all the subse-

quent ones being built up and around these, which are usually three in number. The size and shape of the cell is determined by its future use; but all comb is formed of two sheets of cells placed back to back, the partition walls of the two sheets always alternating with one another. If the comb is intended for brood, 25 cells of worker-brood, and 16 of drone, go to the square inch."

Neighbour, in his work on "The Apiary," says:

"Wax is the animal fat of the bees, and to produce it requires a considerable consumption of honey, to supply the drain upon the system. To be capable of passing through the pores of the abdomen, the wax must, no doubt, be a liquid, oily matter, which, on making its appearance outside the abdominal rings, thickens, and exudes from under the 4 medial ones, in flakes like fish-scales, one on each side; so that there are 8 of these secreting cavities, which are peculiar to the worker, not being found either in the queen or drone.

"The rapidity with which comb-building progresses would lead to the supposition that there is a division of labor among bees, just as laborers convey building material to the artisans on the scaffold above. This work of comb-building is carried forward in warm weather, for a cold temperature interferes with the secretion of wax. Von Berlepsch declares that he has known cases in which a colony has built 300 square inches of comb in a single night!"

The Rev. L. L. Langstroth remarks as follows:

"It is an interesting fact, which seems hitherto to have escaped notice, that honey-gathering and comb-building go on simultaneously; so that when one stops, the other ceases also. As soon as the honey-harvest begins to fail, so that consumption is in advance of production, the bees cease to build new comb, even although large portions of their hives are unfilled. When honey no longer abounds in the fields, it is wisely ordered that they should not consume in comb-building, the treasures which may be needed for winter use. What safer rule could have been given them?"

With all our ingenuity and skill, we have been entirely unable to equal the bees as builders. Only fancy what delicate work it takes to produce comb, the 180th part of an

inch thick!! True, we take the wax they produce, melt it up, spread it into sheets, and then configurate it, showing the base or foundation of the cells—but there our inventive genius, for the present at least, "takes a rest." In comparison with their workmanship, ours is as a thick sheet of wrapping paper to a delicate sheet of tissue paper!

It is estimated that it takes about 5 pounds of honey to produce one pound of wax; it is therefore all-important that all good pieces of comb should be preserved and given again to the bees.

There are three kinds of cells in a hive. The smaller ones are hexagonal, and a little more than one-fifth of an inch in diameter, and are called Worker cells; the larger ones of the same shape are one-fourth of an inch in diameter, and are

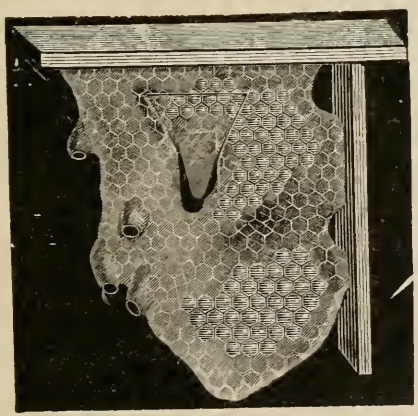


FIG. 11.—*Frame of Brood.*

called Drone cells. These cells may be seen illustrated in Fig. 11. The smaller or Worker cells being shown at the top; the larger or Drone cells, at the bottom. The other cells, of different size and shape, (see Fig. 11.) are Queen cells; one is shown in the centre of the engraving, and four more on the left. They extend vertically or diagonally downwards, and very much resemble a peanut in form and size—they are simply the birth-place of Queens, and are

only built in swarming time, or when the colony is rearing a Queen. The Worker or Drone cells are used not only for brood-rearing, but also for storing honey and pollen, or bee-bread.

At first when the combs are built, they are generally transparently white, but with age and use for brood-rearing they become dark and opaque. The thin cocoons lining the cells, help to make them so; such are, however, just as valuable for breeding purposes for a long time, or until the size is materially diminished, thereby causing dwarfed brood. It is also valuable for storing honey, where the Extractor is used.

POLLEN OR BEE BREAD.

This is the fertilizing dust, or fine meal-like substance, which the bees procure from the stamens of flowers. When deprived of bloom, they will take flour in lieu thereof. Bees collect pollen and carry it in their pollen baskets (Fig. 43, A.) to the hive and store it for daily or future use.

When mixed with honey it is used to feed the young; older bees use it also for food, to elaborate wax, &c.

Bees only gather one kind of pollen at a time. While different bees may carry in several colors at the same time, the pellets on any one bee will be all alike.

Bees require water when comb-building and brood-rearing is going on, and should have access to it.

PROPOLIS OR BEE GLUE.

This is also collected, like pollen, by the bees, from resinous buds, and is used for fastening combs, coating uneven surfaces, and filling up cracks within the hive. They also sometimes use it in hermetically sealing up any offensive matter that may be too burdensome for them to remove from their hives.

THE ESTABLISHMENT OF AN APIARY.

SITUATION, STOCKING AND ARRANGEMENT.

An enthusiastic admirer of the elegant habits of Bees, presistently enquires, Did any one ever sufficiently admire—did he, indeed, ever notice—the entire elegance of the habits and pursuits of bees? their extraction of nothing but the quintessence of the flowers; their preference for those that have the finest and least adulterated odor; their avoidance of everything squalid (so unlike flies); their eager ejection or exclusion of it from the hive, as the instance of carcasses of intruders, which, if they cannot drag away, they cover up and entomb; their love of clean, quiet, and delicate neighborhoods—thymy places with brooks; their singularly clean arrangement of so liquid and adhesive a thing as honey, from which they issue forth to their work as if they had nothing to do with it; their combination with honey-making, of the elegant manufacture of wax, of which they make their apartments; their orderly policy; their delight in sunshine; their apparent indifference to anything regarding themselves, apart from the common good?

BEE-KEEPING A SCIENCE.

To succeed in any calling, we must first gain a reasonable amount of knowledge of the science upon which are founded the rules of that art. Bee-keeping is a science, having for its object the attainment of a correct knowledge of all that pertains to the habits and instincts of these wonderful insects; and a practical art which regards all the attainments thus made as the only reliable basis of successful bee-culture. Therefore, to make the pursuit both pleasant and profitable we must possess the requisite knowledge of the laws that govern these industrious creatures.

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Reading and study as well as experience and observation are essential to obtain this knowledge. The lacking of these things will account for the many failures of those whose enthusiasm is not supported by experimental knowledge!

Every apiarist, therefore, *must* read and study, in order to practice the art with pleasure and profit.

WHO SHOULD KEEP BEES?

Many embark in this occupation who should not; being better adapted to some other. Only those should do so who are fond of the study of nature, particularly of the nature and habits of the honey bee! They must be willing to adopt the valuable improvements of the present day, and keep pace with this progressive age; they must be able to control themselves, in order to control their bees. Such only will succeed—while those who still cling to the brimstone and old fogy notions of their fathers, and who are averse to progressive bee-keeping, who shun the little pets on account of their pungent weapons, and when stung retaliate with more ferocity and less judgment than would become a mere animal—can never succeed, and should avoid bee-culture.

The careless, slovenly and lazy person should not keep bees. The care of an apiary is more than it is usually conceived to be—it is *work!* Work for the brain, as well as the hands and feet!

SUITABLE LOCATION.

As this work is intended principally for beginners and those unacquainted with the business of bee-keeping, we shall not discuss these questions which alone interest the advanced apiarist as to location, &c. We simply say: Get a good location where fruit and flowers abound, and where white clover and linden or basswood is found. Almost anywhere within the United States will be good.

One thing we would say: Don't go where there are already many other bee-keepers, for several reasons: 1st.—If you should have Italians, you don't want to have your queens fertilized by impure drones. 2d. The pasturage may not be sufficient to support more bees. 3d. Older bee-keepers may think you are "treading on their toes," and it may lead to unpleasant feelings, and a disastrous competition.

A territory of three or four miles all alone is quite a luxury, if you intend keeping bees for profit.

Our apiary was located in Chicago, close to one of the main thoroughfares and street-car lines, and the results in both increase of colonies and honey has been exceedingly satisfactory. Mr. Muth, of Cincinnati, has his apiary on the roof of his store—and is successful with it.

We use saw-dust under and around the hives, to prevent the springing up of grass to the annoyance of the bees.—Some use sand or gravel for the same object, with success.

A timber range is very desirable, for a large portion of their honey and pollen they gather from timber and shrubs. Many good localities are found near rivers or streamlets, where linden, sumac, maple, willow, cottonwood, and other trees, shrubs and vines that yield honey and pollen abound.

The bees should be near the house, or where they can be heard when they swarm. They should be so located that the north and west winds would not strike them, where they can have a warm, calm place to alight.

A hedge, high board-fence, or building on the north and west are a protection against the strong winds which destroy very many laboring bees in the spring, when one bee is worth as much as a dozen in the latter part of summer, as they are then much needed to care for the brood and keep it warm.

If, in April, the day has been rather warm and the evening cool and windy, hundreds of bees may be found on the ground in front of the hive, perhaps loaded with pollen, but exhausted from the flight and chilled with cold. As they approach the hive they relax their exertions, and a light whiff of wind dashes them to the ground, from which they are unable to arise, and before the sun could warm them up, the next morning, they will be dead.

If you have no shade for your bees, it would be best to plant fruit trees among them. These would not only supply them with pollen and honey in blooming time, but acceptable shade in hot summer days. Another thing is apparent, *i. e.*, the fruit would be a remuneration. The bees would fructify the trees and make them to bear plentifully—while in return, the trees would afford to the bees that shade which they so much require, from the burning rays of the sun.

WHICH WAY SHOULD HIVES FACE.

There seems to be no facing superior to the one that allows the sun's rays to shine directly into the entrance of a hive at 11:30 a. m. There is not a difference of any consequence between a south, south-east or south-west aspect, and selection may be made to suit the apiarist's notion. Next to this, we should say, face to the east; if this is impossible, then west —and when no other is available, submit to a north frontage.

WHEN TO COMMENCE.

The reason why many are unsuccessful is that they commence at the wrong TIME. It may have been noticed that about every third year has been a poor season for bees. After such a season but few will commence; while, if the next is a good one, many think the matter worthy of their attention, and if this is followed by another prosperous year, they then decide to embark. But alas, that is just the time to meet the third year's reverse. Those, therefore, who engage in the business should not be discouraged at one reverse.

Early in the spring is the best time to begin—and thus secure an increase of bees as well as honey the first year.

HOW MANY COLONIES TO BEGIN WITH.

Purchase a colony from some reliable breeder or dealer, and in order to get experience, increase from one or two colonies—not more.

As it is essential to know WHAT to do, WHEN to do it, and HOW to do it, we cannot too strongly advise the beginner to purchase a good manual of the apiary, and STUDY IT WELL. This is absolutely essential to success.

REMOVING BEES.

After procuring the bees and selecting the location and position in the apiary, the next thing is to know when and how to remove the bees. In the spring or fall will be the best time to remove them. In the hot weather the combs may be broken down in transit, and general ruin may be the result.

In September or October they may be removed with safety,

but the best time to begin an apiary is in April or May. Only strong colonies should be purchased, unless nuclei colonies are desired in the spring to build up into strong ones by the fall.

If the distance is less than half a mile, they should be removed late in the fall, or the purchaser may lose heavily by the bees going back to their old location. Only a few days since, we heard of a man buying a few colonies of bees of his neighbor; and, to his surprise, only the young bees, brood and Queen remained, after a few days—the old ones having gone back to their former location, and either died in trying to find their old home or united with other colonies.

It is necessary, however, for their health that shortly after completing their journey they should have one or two fine days on which they can go out and relieve themselves. The disturbance created by transport causes every bee to fill itself with honey, and the condition thereby induced is unfavorable to lengthened confinement. We can always calculate on a fine day occurring after a short interval, in the fall—but one suitable for bee flight may not happen in winter till after the lapse of several weeks. If bees eat freely, and are constrained by an inclement atmosphere to remain long within their hives, evil consequences follow. This is what sometimes causes destruction to colonies moved in winter.

WHAT KIND OF BEES TO GET.

Some prefer to purchase black bees in box hives, and then transfer them to movable frame hives in order to get experience. In that case, they should be populous colonies with the comb yellow or brown. Then the honey received will help to pay for the cost of transferring.

The best satisfaction may be obtained by purchasing strong Italian colonies in the spring. Such will, doubtless, in a few seasons, pay for themselves, thus proving the cheapest in the end, though a little more outlay is required at first. One such colony is worth two of the former.

To examine a BOX HIVE, incline it to one side, looking from the bottom up, between the combs. By using a smoker, the bees may be driven back, and one may discover if it has

capped brood, larvæ and plenty of bees. It should have such, to be considered in good condition.

BUYING "SWARMS OF BEES."

A first swarm is always to be preferred, and if possible from a colony which gave a swarm the previous year, for then the old queen will be in her second year—vigorous and at her best. A small, second swarm should be passed by, in purchasing. Arrange the frames about $1\frac{3}{8}$ inches from center to center; tilt the hive forward, at an angle of 20 to 25 degrees, and they will be almost certain to build straight on the top-bars of the frames. If an old colony is purchased, let it be one that was heavy in the spring, with straight comb coming entirely down to the bottom of the frames, or having as much of it as possible.

HOW TO CARE FOR A FIRST COLONY.

If it comes by express or freight, take it home carefully in a spring wagon. Be sure that the combs run lengthwise of the wagon; drive slowly and handle with care. Place the hive in the position you wish it to occupy, and let it remain until evening, when the wire cloth that is usually nailed over the entrance may be removed, and some board or other obstacle placed in front of the hive, so that when the bees come out in the morning, they will circle around and mark the location, before going to their work, and thus return in due time with safety. About mid-day, it may be well to open the hive and see whether any combs are broken down, and if so, get them straightened up, and fastened either with twine or wire, until the bees have secured them, when such fastenings should be removed. Be sure to smoke them well, before opening the hive.

BEES KEPT ON SHARES.

As some may desire to keep bees "on shares"—though we never think it desirable to do so, as it often leads to misunderstandings and quarrels—we will here give the customary "terms" of such contracts:

It is usual for one party to furnish the colonies of bees, and the other party the care and labor. The expense of new hives, surplus boxes, comb foundation and queens, is usually

divided equally, and at the end of the season the honey and increase of bees are equally divided—leaving each to take all chances of marketing, as well as wintering.

Always make a written contract, stating the agreement in full, and then there will be less liability of a misunderstanding.

BEES MARKING THEIR LOCATION.

This is done through the sense of *sight*. A large percentage of the bees that fly out in the early spring are those that have come into being during the winter and early spring; consequently they do not leave the hive in a straight line, but only go a few inches, then turn their heads towards the hive and oscillate back and forth in front of it; then moving further back, still hovering in front of the hive, with their heads towards the entrance, occasionally advancing towards it, as if to note more particularly the place of entrance and its immediate surroundings, they then increase the distance, taking a survey of buildings, trees, fences, or other noticeable objects near by, after which they return to the hive, and start in a direct line from it. On returning, they come directly to the hive and enter; the surrounding objects and the color of the hive are all noted by the bees.

CHANGING THE LOCATION.

It is desirable not to change the location of hives, unless it becomes absolutely necessary to do so. After the bees have become familiar with their location, should the hive be moved a few feet, they will not notice it when departing on their daily rounds, and if there are other hives near, they may perish in attempting to enter other hives or in wandering about, seeking their own home.

When it becomes necessary to move the hives, it should be done gradually, not exceeding the breadth of the hive each day. Or if they are to be moved several rods, alarm them by smoke blown into the entrance, then close it, and remove, placing some obstacle before the hive previous to opening the entrance again. In moving half a mile or more, the result is different; they note the new locality and return to it.

WILL BEES INJURE FRUIT?

Bees never puncture fruit, and unless the skin has been broken by other insects or birds, they never molest it. Any one can easily determine whether bees injure grapes or not. We know it is charged against them by some persons, but if any one will take sound grapes and hang them up in the apiary where the bees have full access to them, the matter can be easily demonstrated. This experiment has often been tried, but we have never yet heard of a single instance where the bees have punctured even one sound grape.

Dr. Wm. R. Howard, of Texas, says: "I have tried the following experiments: Bees were covering the grapes in the vineyard, and seemed actually intoxicated on the wine. Removing several bunches, some of which had punctured berries, and some sound ones, were taken to the apiary, and the bees soon found them and went to work vigorously. As soon as the punctured ones were exhausted, the bees abandoned them and went in quest of something better. Then the bees were furnished more of the same lot, and closed in the hive; as soon as the punctured ones were exhausted, they seemed uneasy, then bunch after bunch of sound grapes were given them, which were eagerly covered, but as soon as it was found that none were punctured, they fell back in dismay. The mandibles of the honey bee are not dentate or serrate, but are simply smooth, and beautifully rounded at the points, spoon or scoop-shaped, covered on the body with fine hairs rather long, and on the edges are covered with still finer hair, with a second row around the internal surface, just suited to work soft wax, brush it up and give it the proper finish. If any one will examine these mandibles with a good microscope, it will satisfy him at a glance of the incapability of the honey bee to damage, by puncture, any fruits whatever."

Mr. D. H. Cutting, of Michigan, remarks: "I suspended a cluster of grapes under a tree, and poured sugar syrup on it; they took all of the syrup, but did not damage the cluster, until a wasp managed to bite three berries before I could kill it; those three the bees finished. With many experiments, during five years, being surrounded by bees and affording them every opportunity of doing damage, and, failing to find them doing any, I think those who condemn the bees should

experiment for themselves, and ascertain whether the bees do them any damage or not; they may come to the same conclusion as did the people of Massachusetts, who, years ago, thought the bees damaged their fruit, and had them banished, but, finding that fruit began to decrease and become of a poor quality, were only too glad to have the law repealed, and get the bees back again, when their fruit improved again."

CLEANSING COMBS CONTAINING DEAD BROOD.

Brood is sometimes deserted by the bees from some cause, and, of course, dies—it might have been spread too much, or the bees were insufficient to properly care for it. It is often asked what to do with the combs containing such dead brood. We would say: Uncap those cells in which brood has died, then put them away in some dry place till the dead brood has dried and shrunken. When wanted for use, put them one or two at a time in the stronger colonies, where they will be speedily and thoroughly prepared for use. In order to make them desirable for brood combs, it is necessary that the cells be ready for the queen's occupancy as soon as she reaches the comb, or she will either pass over the comb entirely, or deposit her eggs here and there, wherever she finds unobjectionable spots. Every close observer has noticed that the queen invariably makes a close inspection of the cell she proposes using, and unless perfectly clean she will not deposit an egg in it. With a cell here and there occupied with dead larvæ, it is easy to imagine how the living larvæ adjoining may be more or less liable to become chilled, as inanimate bodies are not possessed of the natural heat which pertains to those living. It is undoubtedly this natural law which instinctively impels a "good" queen to deposit her eggs compactly in an oval space in the comb, thus economizing to the greatest extent the heat of each individual larva to help keep its neighbor warm. To what extent the presence of dead brood in the combs (which has died from natural causes) may have caused the death of contiguous brood, we cannot say, but certainly it has contributed largely to many of the theories regarding "foul brood" and its tendencies, and perhaps in rare instances has had a tendency to enfeeble many of those bees which survived to maturity.

It may not be out of place, in this connection, to advise that the stronger colonies be selected to do all the drudge-work of the apiary, such as cleansing befoul ed combs, removing mold from combs, and pulling out such dead bees from the cells as will not shake out when dried and shrunken. If your strong colonies have their hives already filled with frames of brood, then remove sufficient to accomplish the purpose; but where a colony is already feeble, and it is desirable to build it up rapidly, no disagreeable work should be imposed upon the bees to perform, for it will task their energies sufficiently to provide pollen, water, and do the feeding and nursing necessary for successful brood-rearing. A strong colony will accomplish in a few hours that which would embarrass a weak colony for nearly a whole season.

ANTS IN THE APIARY.

These are sometimes troublesome in the apiary. The following remedy is practiced and recommended by Mr. A. B McLavy: "With a weeding hoe, clear the ground in and around the yard of weeds and tufts of grass; in a day or two, the ants will have established a trail from their beds to the hives. By this means you can readily trace them home. To a five-gallon can of water, add, say, ten ounces of cyanide of potassium, and let it dissolve; with a trowel dig gently in the ant-bed until you find the nest, which will be known by the white eggs. Then pour on the water, and make the dirt into a thin mud right in the nest, pour the water on plentifully, so as to effectually poison the very earth. By this means you dispose of ants and queen ant, and unfit the larvæ for reproduction. You may miss destroying it at the first trial, but will eventually clean them out. Keep the cyanide of potash out of reach of children, as it is a violent poison. It retails at the drug stores for about one dollar per pound."

REMOVING PROPOLIS FROM THE HANDS.

We are often asked what will remove bee glue from the hands. Alcohol or spirits of turpentine will do it; or a little slacked lime kept in the bee house will be found convenient, during the summer, to remove propolis from the hands. Moisten the parts desired to be cleansed, then rub with wet lime until the propolis is removed.

HIVES AND SURPLUS HONEY RECEPTACLES.

WHAT HIVE TO USE.

Indefatigable industry is the peculiar characteristic of the Bees. During the height of their harvest, they often sally forth even before the rising of the orb of day, and when the short twilight of evening has cast its somber mantle over the face of nature, they may sometimes be seen returning to their homes laden with sweets, which, but for their industry, would be forever lost. Neither the scorching rays of the sun, nor wind, nor storm, will stop them ; they avail themselves of every moment that can be employed to advantage, when the fields are decked with flowers containing the precious nectar !

The Creator gave to the Bees no written law, but to guide their labors, He imparted to them instinct to a surprising degree. When the faded bloom and darkened horizon indicate the approach of winter, they look to their hoarded stores for sustenance till the early flowers of spring put in an appearance.

As they provide abundantly, their keeper may reasonably call for the surplus, after supplying their own necessities.— For this he should supply them with a neat and comfortable home, having all the conveniences for storing the precious nectar in convenient and attractive shape. It is, therefore, a matter of some moment to decide what style of hive will best accommodate them as well as their master.

A good hive will give the apiarist complete control of the frames of comb, and afford no harbor for moths. It must give sufficient room for the breeding apartment as well as for surplus honey, and must admit of close scrutiny and easy manipulation.

THE LANGSTROTH HIVE.

Though movable-frame hives were in use in Europe, in rude form, as early as 1795, they were not at all practical until the illustrious German, Dzierzon, invented a hive, in 1848, and our own distinguished and honored Langstroth, in 1852, presented the world with one that has, with his system of management, completely revolutionized bee-keeping everywhere, making it a practical science.

The patent which was issued to the Rev. L. L. Langstroth in 1852 expired in 1873, and there is now no patent either on his hive or frame.

With the movable-frame hive, all the combs can be taken out and replaced, or exchanged with other hives at will, without the least detriment to the bees. The combs having a surplus of honey can be emptied with the Extractor, with-

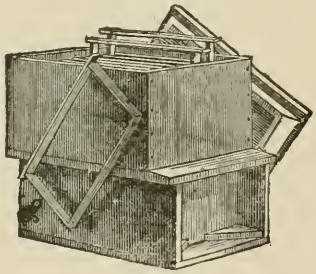


FIG. 12.— *Langstroth Hive.*

out injury, and returned to the hive to be refilled,—thus saving labor for the bees in making new combs, and honey for their keeper.

The Queen can be found, examined, and, when necessary, can be replaced by one more prolific, or one in some other way more desirable; and artificial colonies can be made at will, as we shall see hereafter. If a colony be weak, it can be strengthened by giving it a frame or two of brood from some other hive. In fact, the movable frame makes the bee-keeper "the master of the situation."

"DOVETAILED" OR LOCK-CORNER HIVE.

The hive illustration on the preceding page shows a portico Langstroth hive and V top-bar frame, both of which were used

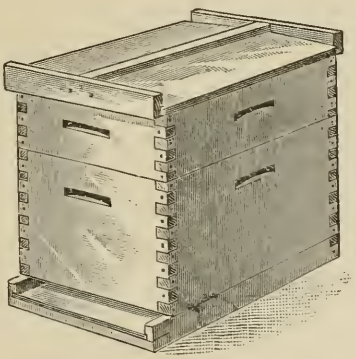


FIG. 13.—*Dovetailed Hive.*

many years, but in 1889 what has since been popularly known as the "dovetailed hive" was introduced, and since its advent almost every other hive has had to give way to it.

HOFFMAN–LANGSTROTH BROOD FRAME.

(See Illustration on page 40.)

The brood-frames commonly used in this hive are called the Hoffman self-spacing, eight or ten of them being used in the lower story. These frames measure 9⅛x17⅝ inches, outside measure, and are either spaced by wood projections on either side of the end bars a part of their length from the top, or else by wire staples, which keep them apart the proper distance when in the hive. Recently these brood-frames have been made with staples driven into their ends, just under the top-bar, to hold them in proper position, thus allowing the top-bar projections to be shortened, causing less fastening by propolizing of the ends to the hive by the bees.

THE PRODUCTION OF CHOICE HONEY.

In no country on the face of the earth is honey produced, either in ancient or modern times, that can excel that produced in North America. Nature has supplied this vast Continent with honey-sources as varied and plenteous as can be found anywhere in the world. And within the past few years, many improved methods and appliances have been invented for the increased production of honey, as well as to multiply the volume and vastly enrich the quality of the product. Simultaneously with these improvements, we find the consequent increased consumption. Heretofore it was a luxury, enjoyed only by a few—but now it takes its place among staple articles. Improved management, as well as increased production, has brought the price down to that which can be afforded by every family.

HONEY IN THE COMB.

Not only have we forsaken the log-gums and rude straw and box hives of our fathers, and given these busy little workers a neater home, with movable frames to contain their combs, but we have taught them to store their surplus honey in small sectional-frames, so that it can be easily

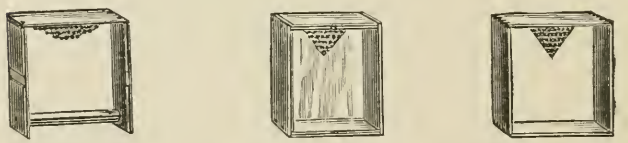


FIG. 15.—*Honey Frames and Sections.*

taken from the hives when full, and marketed in convenient shape, suited to the requirements of retail purchasers.

The first improvement was to get the surplus honey in "boxes" holding two or more combs. Then came the "California frames," invented by Mr. J. S. Harbison, which were made something like the standing brood-frames, only they were about 6x6 inches in size, and the sides and top were 1½ inches wide, with narrower bottoms. (Fig. 15 *a*.)

The first "honey-boxes" were made to hold several combs about six inches square. A. G. Hill, of Indiana, conceived the idea of inserting "comb guides" two inches apart, and then sawing about half way through these boxes, between the "guides," so that the retailer could, with a knife, cut the combs apart, without injuring the honey-combs.

About the same time, Geo. T. Wheeler, of New York, invented honey-boxes for single combs, having wood tops and bottoms, and glass ends; and when taken off the hives (where full-sized, tin separators were used) the sides were also glassed. The bee-entrance was a "slot" in the bottoms.

Then N. N. Betsinger, of New York, invented the honey box (Fig. 15 *b*) made by nailing 2x⅛ inch sides to 1½x⅛ inch tops and bottoms, to be used with tin separators, and glassed on the sides after being taken from the hives. These were to hold two pounds of honey.

Then A. I. Root, of Ohio, made one-pound sections, eight of them, 4¼x4¼ inches, to fit a "wide frame" of the same size as the Langstroth brood-frame. These were of ⅞-inch wood all around, and "dovetailed;" the sides being 2 inches, and the tops and bottoms 1⅛ inches wide, leaving room for the bees to enter between every two—to be used with tin separators 3½ inches wide.

After the four-piece dovetailed sections before mentioned, Prof. Cook used berry-box stuff bent to shape around a block, and nailed. Then several attempts were made to get the sections made in one-piece; but that was not perfected until about 1880, in Watertown, Wis., when the present one-piece section with **V**-groove was perfected.

For years these two-pound sections were the favorites for marketing comb honey—but they are now nearly driven from the market by the one-piece sections holding one pound of honey, and measuring 4¼x4¼ inches, outside.

FIG. 16.—*One-Piece, One-Pound Honey Section.*

This cut shows the 4¼x4¼ one-piece section, the grooves being represented by a, a, a. These can be easily bent into the shape of a box, by hand, but that can of course be done much faster by machinery.

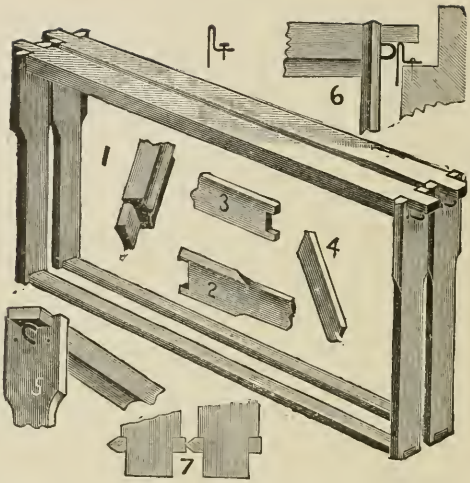


FIG. 14.—*Hoffman-Langstroth Brood-Frame.*
(See page 37.)

PLAIN SECTION-BOXES AND CLEATED SEPARATORS.

For years the section-box has been made with one or more scallops on each size, for the purpose of allowing the bees to enter from below, and also to pass on up to another tier of sections when supers are tiered upon the hives. But lately there

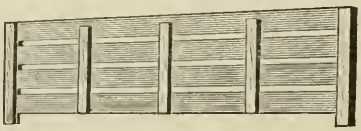


FIG. 17.—*Fence or Cleated Separator.*

has been introduced what is known as the "Plain" section, all scallops being omitted, and the sections being made 1⅛ inches in width. In order to allow the bees to get into the sections and also pass on up to those placed over the first tier, the separator used between each row in a super are cleated in such

a way as to hold the rows of sections apart. Such separators have been called "Fences," or cleated-slat separators. The illustration on page 40 gives an excellent idea of this new separator.

Of late there has been much said about the use of a tall honey-section, some claiming that a more attractive appear-

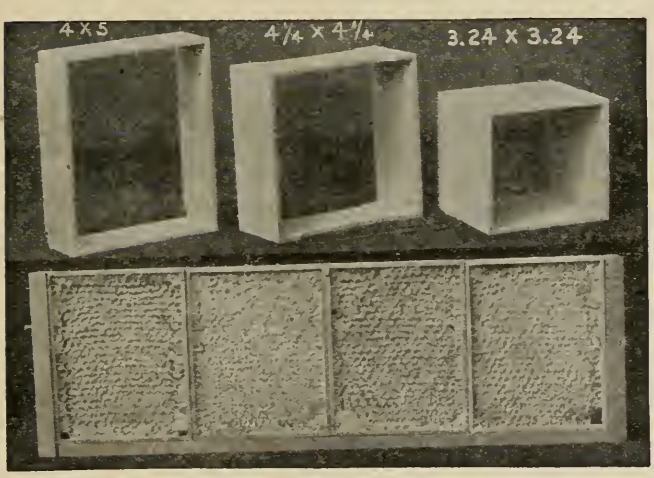


FIG. 18.—*Oblong and Square Sections Contrasted.*

ance is secured once it is filled with honey. They are made in various sizes, 4x5 inches, and 3⅝x5, being the more commonly used, and the width being 1⅞ inches.

SUPERS FOR HOLDING SECTION-BOXES.

There are various arrangements for holding the section-boxes in which is placed the surplus honey. Perhaps that most widely used is the section-holder super. A super used on an 8-frame hive holds six of these section-holders, and for a 10-frame hive seven of them. Each section-holder takes four sec-

tions 4¼x4¼ inches in size. A separator is then placed between each two section-holders, to compel the bees to build

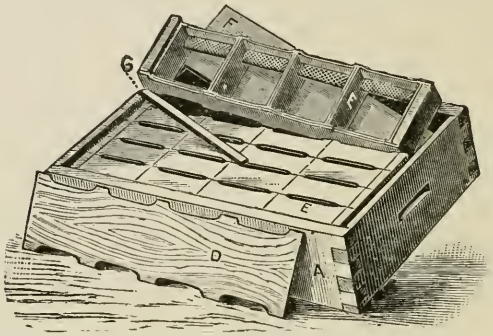


FIG. 19.—*Super of Section-Holders.*

EXPLANATIONS.—D, solid wood separator; A, dovetailed super; E, section-boxes; F, follower-board; 6, wedge for between follower-board and super side, to make all solid.

straight combs in the sections, or to prevent bulging of combs either to one side or the other of the sections.

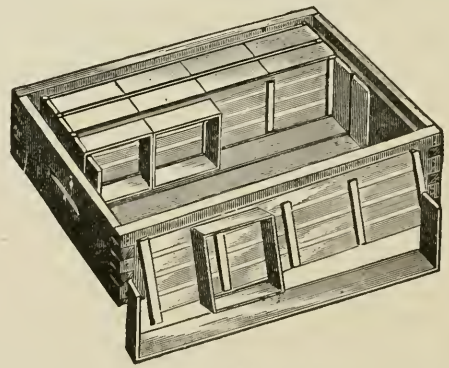


FIG. 20.—*Super with Plain Sections and Fences.*

A section-holder might be called a wide frame without a top piece, simply two end-blocks nailed on a bottom slat. The

section-holders are supported in the super by two strips of tin nailed crosswise under each end. The section-holders, with the sections and separators, are then wedged up from one side by the use of a follower-board and a wedge, thus making all snug and tight.

REMOVING HONEY FROM THE SUPER.

Before taking honey from the supers, of course it is necessary first to get the bees out of them. Dr. C. C. Miller does this by piling up 8 or 10 supers just as taken from the hive (with bees, honey and all), on a bee-escape board, and then inverting another bee-escape board over the pile of supers. The bees will leave in a few hours and return to their respective hives, when the supers can be taken into the house, and the honey removed without any annoyance from the bees.

SHIPPING-CASES FOR HONEY.

Cases in which to pack comb honey for shipment are made in various sizes, holding from 12 sections to 28 in a single tier.

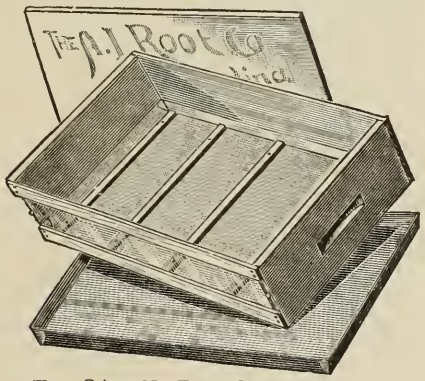


FIG. 21.—*No-Drip Shipping-Case.*

Those most generally used hold 12 or 24 sections of honey. The 12-section case generally shows three sections through a

glass side, and the 24-section case shows four sections next to the glass.

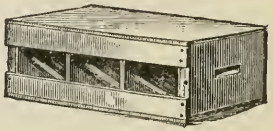


FIG. 22.—*Three-Row 12-pound Shipping-Case.*

The most satisfactory shipping-case has inside a folded paper pan at the bottom, upon which are tacked small strips crosswise whereon to set the sections. This forms what is known as the "no-drip" shipping-case. Should there be any

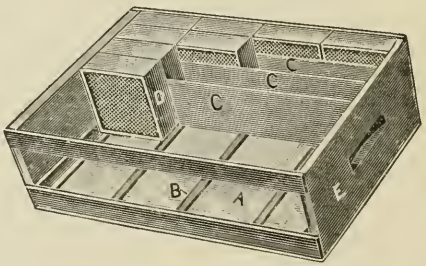


FIG. 23.—*No-Drip Case for Plain Sections.*

dripping of the honey it simply is caught in the paper pan, and the cross strips hold up the sections so that they do not rest in the honey-drippings. Of course only perfect sections of honey should be packed for market, and not any that are at all in a leaky condition.

SHIPPING COMB HONEY TO MARKET.

A few directions on packing comb honey for shipping by railroad may be useful. It is best to have a large crate hold-

ing perhaps 16 of the 12-section cases, or 8 of the 24-section cases. First put about four inches of straw in the bottom of the large crate, then place in the cases of honey, not forgetting

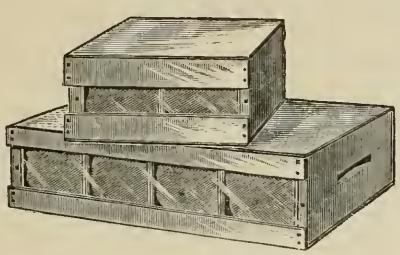


FIG. 24.—*Shipping-Cases.*

to put straw at the sides and ends of the large crate, as it is filled with the cases of honey. The straw acts as a cushion. After nailing on the top pieces enclosing the large crate, nail a three or four-inch board on each side, about a third of the

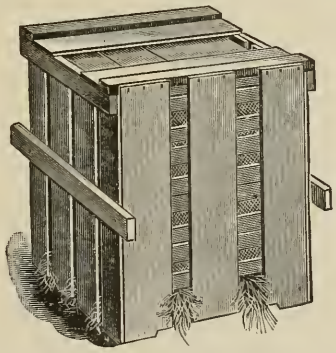
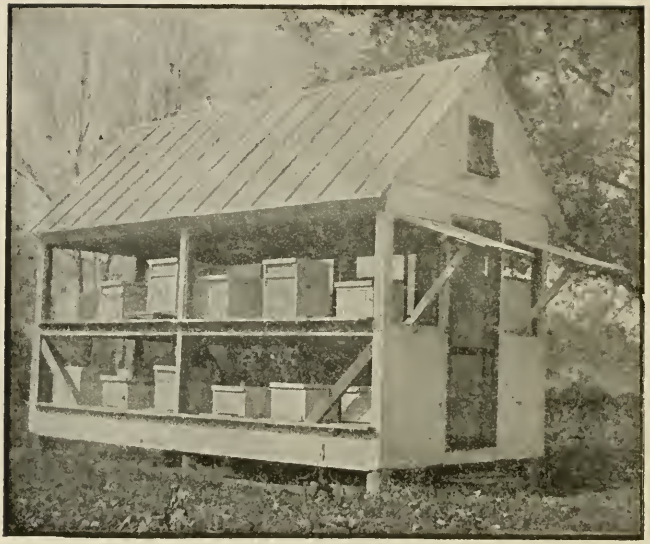


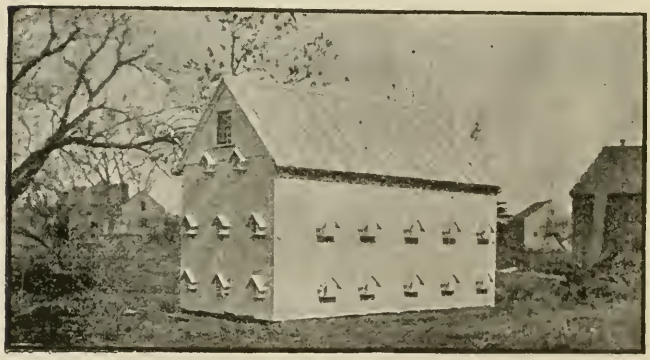
FIG. 25.—*Crate for Shipping Honey.*

way down from the top, to be used as handles for carring the whole crate of perhaps 200 pounds of honey. Thus two men can carry it easily, and there is practically no danger of breakage, if properly packed.

A MODERN HOUSE-APIARY.



Summer View.



Winter View.

PRODUCTION AND CARE OF HONEY.

PREPARATION FOR THE MARKET.

The Arabs, it is stated, obtained their knowledge of Astronomy while crossing the trackless desert, being compelled to observe very closely the position of the stars to guide them in their journey. Just so should the bee-keeper closely watch the continual and varied changes that occur in the demands of the public concerning the preparation of honey for the market. Instead of settling down to the conclusion that, in reference to marketing honey he knows it all, he should be careful to observe what dealers and consumers demand, and then at once, freely and fully meet the requirements of the trade. In this way only, can he become a successful apiarist.

The progressive producer of this God-given sweet is never surprised to find that the methods of preparing honey for the market, which were acceptable during one season, are behind the times for the next, and require modifications or improvements in order to keep pace with the public requirements.

HOW SHOULD HONEY BE MARKETED?

It should never be forgotten that honey of good quality, and in any of the popular packages, will *command* the highest price, and be in constant demand. Such tempt the purchaser, and cause a steady demand.

The marketing of honey is a subject that interests every apiarist. In order that honey may be sold readily, it MUST BE ATTRACTIVE! Has it never occurred to the reader to inquire why bolts of muslin are labeled with pictures of luscious fruit? Or why boxes of fancy toilet articles are adorned with lithographs of enchanting faces with bewitching

smiles? Answers to such questions offer us instructive lessons that will pay for the learning! Manufacturers know full well that in order to have their goods sell readily, they must be attractive! No matter how good the quality, nor how cheap the price—they must *attract* and *please the eye!*

To-day, comb-honey is *the preference* for table use, and if we would cater to the public want, we must produce that article in the most attractive shape. This must be arrived at by growth! We could not obtain "the most desirable shape" at one bound, but may approximate perfection!

No product of field or farm varies so much in price as honey; and why? Because of the unattractive manner in which some put it upon the market. It only requires to be attractively put up, to find ready sale at remunerative prices. If we meet the requirements of consumers, there will be a demand for all the honey produced in America.

As the articles for sauce decrease in the fall, the thrifty house-keeper looks around for something to take its place besides canned fruit. Honey is just the thing she desires; and it only remains for us to convince the millions of house-keepers of that fact, for the demand to increase and grow astonishingly—if the supply be kept up attractively.

One great question, towering far above all others in importance, is: "*How* to dispose of honey to the best advantage." In vain do we talk of the best hives—the best implements for every department of the apiary. In vain do we toil and labor from morn till eventide, manipulating our pets and their surroundings. In vain do we tell of the large amount of honey stored away in our honey houses. *Vain* is all this, if we cannot dispose of it to advantage and thus *reap the reward* of our well doing.

ASSORT AND GRADE THE HONEY.

All honey should be graded, and a scale of prices be established. Now, one compelled by his needs, may sell honey at the commencement of the season for any price offered, and thus unintentionally break down the market, by giving a start at too low a rate. Systematic organization could and should help this state of affairs. Some State Conventions have appointed committees to grade and then dispose of the honey of the members. If this were done in every State or district, we should hear no more of the markets being broken down by premature and forced sales.

MANAGEMENT OF COMB HONEY.

Comb honey should be taken from the hive as soon as it is finished, or as soon thereafter as possible. "No apiarist can expect to have his honey sell for the highest market price," says G. M. Doolittle, "if he allows it to stay in the hives for weeks after it has been sealed over, allowing the bees to give the combs a dirty yellow color, by constantly traveling over it. All comb-honey producers know that there always will be cells next to the section that are partly filled with honey but not sealed over, and when taken from the hive, if the section is turned over sidewise, the honey, being thin, will run out, making sticky work. The remedy for this is a small, warm room. Bees evaporate their honey by heat, and therefore, if we expect to keep our honey in good condition for market, we must keep it as the bees do, in such a position that it will grow thicker, instead of thinner all the while. Our honey room is situated on the south side of our shop, and is about 7 feet square, by 9 feet high. We have a large window in it, and the whole south side is painted a dark color, to draw the heat. In it the mercury stands from 80° to 90°, while our honey is in it; and when we crate it for market, we can tip our sections as much as we please and no honey will drip, neither will any of the combs have a watery appearance—all will be bright, dry and clean. But if we keep honey thus warm, the moth will make its appearance, and make it unfit for market, by gnawing off the sealing from our beautiful combs.

"We build a platform on either side of our honey room, of scantling, about 16 inches high, and on this we place the sections so that the fumes from burning sulphur can enter each one; in about 2 weeks we fumigate, by burning $\frac{3}{4}$ of a pound of sulphur for every 200 cubic feet in the room. We take coals from the stove and put them in an old kettle, so as not to get anything on fire; pour on the sulphur and push it under the pile of honey, and shut up the room. Watch through the window, and in 15 minutes after the last fly or bee that chances to be in the room has died, open the door and let out the smoke, for if it stands too long, the smoke may settle on the combs and give them a greenish hue. As there may be a few eggs that have not yet hatched, we fumigate again in about 10 days, after which the honey will be free from moths, if you do not let millers into the room."

HANDLING AND SHIPPING.

It has been estimated that the surplus honey product of America amounts to seventy-five millions of pounds; therefore, the placing of this enormous product upon the market is a subject of vast importance to honey producers. Any method that will add one cent per pound to the marketable value, is worth to them three-quarters of a million of dollars; and any error of management, causing a reduction of one cent per pound, is to them a corresponding loss! We should ascertain what the market demands, and then diligently apply ourselves to the work, in order to reap the reward of "well doing," and rejoice in the labor of our hands.

Honey in the comb is a luxury—a fancy article—and our first care should be to produce it in such a manner as to command a fancy price. It must captivate the eye of the consumer, and tempt him to purchase. To this end comb honey should be put up in single-comb sections, all combs being straight and evenly built, and labeled with the kind of bloom which produced it, giving the producer's name and address. It should be put up in uniform crates, and not veneered, *i. e.*, the combs inside should be just as good as those on the exterior of the crate. Small packages sell the most readily; twelve in a crate (fig. 20) is usually sufficient, and always the most desirable for the jobbing trade.

The apiarist should give his personal attention to its crating, grading and shipping, so that he may be positive as to the details, should any question, involving these, be raised by the consignee. The inexperienced and careless ones are always a detriment, and sometimes ruin the market for their more careful and experienced neighbors. They take an inferior grade of honey, put up in irregular and soiled packages, to market early, just to get a little money, and sell for any price offered; and this often settles the price for that locality and season, and the attractive honey is either sacrificed to their carelessness, or shipped to another market.

If shipped away to market, it must not be packed in straw or chaff; but put in small crates containing a single tier (fig. 20), and placed with the top bar downwards, which is the strongest way, and will prevent much breaking down. Ship

by freight, for the expressage will be so high that it will take off all the profits, and is, in nearly all cases, liable to do as much damage as when sent by freight. See to its packing in the car, wagon or vehicle, and place the combs lengthwise to the engine, but crosswise to the horses, and give direction not to have it unloaded on trucks, but invariably to be unloaded by hand.

WHAT TO DO WITH CANDIED COMB HONEY.

When honey becomes old and candied in the combs, it cannot be removed by the Honey Extractor, and inquiries are made as to what to do with it. This is Mrs. L. Harrison's method: "The honey was mashed up in a pan, and set over a kettle of boiling water, and stirred frequently. Before the honey was very hot, the wax had risen to the surface, and being set out in the cold, quickly congealed, so that the warm honey could be poured from under it, through a coffee strainer into another vessel, leaving the wax in the pan. After the honey was melted, the wax was all melted up together, and considerable honey of inferior quality was under it, which can be kept separate and be used for cooking, making gingerbread, etc. The rinsings of vessels used in manipulating the honey, will make excellent vinegar. The wax can be melted in a pan over boiling water, and should be poured, when melted, through a hot coffee strainer, and when cool, will be of a light straw color."

MANAGEMENT OF EXTRACTED HONEY.

The marketing of extracted honey is an important matter, for a good article, attractively put up, will always command the best price, and it is, therefore, of the utmost importance to producers to have honey put up in the best shape.

None but a thoroughly good article should be produced or placed on the market, as the price depends on the quality. A good article of extracted honey has excellent qualities, which, when well known, will commend it to all consumers, and is equal in every respect to the very best article of comb honey.

It is very gratifying to know that extracted honey is now produced to a much larger extent than ever before. Without

saying anything to the disparagement of comb honey, we may say that we think it will become a staple only in the *extracted* form. Its excellent qualities, when better understood, will bring it into almost universal favor.

Every bee-keeper should fully supply his own locality, and he should let it be distinctly understood that it is the pure honey taken from the combs by centrifugal force—that nothing is added to it, and nothing taken from it but the comb—that it is not the old-fashioned "strained honey," which was obtained by being taken from mashed brood-combs, and "strained" from dead bees, pollen, &c., but that it is the *pure* liquid gathered from the flowers, which will give health to the body, force to the mind, and strength to the intellect of those who use it.

It should also be kept before consumers that granulated honey can be reduced to its liquid state in a few moments by placing the honey in a jar in warm water. When thus liquefied, it so remains for some time before again crystallizing. Consumers may be sure of a wholesome article by purchasing granulated honey and reducing it.

Mr. Heddon used earthen crocks holding about ten pounds, and he likes them very well; it is very convenient to take the honey from them when it is candied, or to liquefy it by placing the crock in warm water.

If the product is for a home market, then, of course, the producer must study the local preference regarding the size and style of package, as well as the grade of honey most easily disposed of. As far as practicable, keep each grade of honey separate; it is a mistake to suppose a few pounds of inferior or different shade honey will make no difference in a large bulk of white clover honey, or that thereby a better rate will be obtained for the second grade article. Instead, the result will most likely be to class it all as second grade, and the price of all will be depreciated. Again, if possible, keep the white clover and basswood honey separate. In order to do this, keep a vigilant watch of the basswood bloom, and extract the white clover quite close before the bees commence gathering from the former. A little clover in the basswood honey, however, will not do the harm that would result if the proportions were reversed. After the basswood

harvest is all gathered by the bees, extract it closely, for it will not do to taint any other honey, even though it be from fall flowers and somewhat darker, with its aromatic flavor.

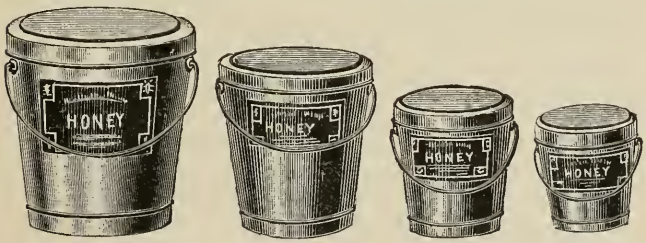
TIN PAILS FOR HONEY.

For retail packages, tin pails (fig. 28), with close-fitting covers, are the best. Purchased by the gross or in lots of 1,000 or more, the price is so inconsiderable that no consumer will object to paying what they cost, in addition to the price of honey, for they are so "handy to have in the house" that not one in a hundred would return the pail.

To hold 3 pounds. 5 pounds. 10 pounds.

FIG. 28.—*Straight Pails.*

A neatly printed label should be gummed or pasted on each Pail, stating the amount and kind of honey, name of apiarist by whom put up, and giving in a foot-note directions for liquefying the honey in case it granulates.



To hold 25 pounds. 13 pounds. 7 pounds. 4 pounds.

FIG. 28.—*Tapering Pails.*

They are heavier and stronger than the straight Pails; the covers are deeper and the top-edge of the Pail is doubled over. A smaller size is also made to hold about one pound.

If smaller packages are wanted, then use glass jars (fig. 29) or tumblers. These are always worth their cost in the family —the former for pickles, catsups, and a thousand other uses, while the latter are equally appreciated for their convenience in putting up jellies, etc. Jars and tumblers, like the tin pails, should be tastefully put up and labeled.

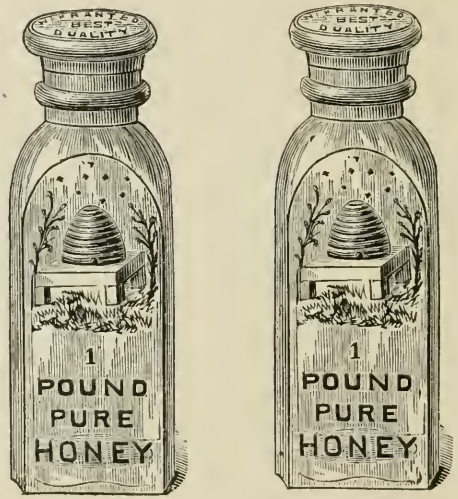


FIG. 29.—*Glass Honey Jars.*

For a retail market, excellence of goods should be the prime consideration, but the attractiveness of the package should never be lost sight of. Manufacturers of adulterated goods, of nearly every description, depend more upon effecting sales by the employment of attractive packages and tasteful, pretentious labels than upon the excellence of the pretended article sold. In this respect, bee-keepers have been wofully negligent, and many have appeared wholly indifferent as to the appearance of their honey, seeming to imagine that their personal assurance to the grocer of the purity of the article, was sufficient to convince the public of its desirableness.

If the extracted honey be destined for a metropolitan or foreign market, an entirely different method of putting it up should be employed. There is nothing more convenient, attractive or economical than square tin cans, or small kegs

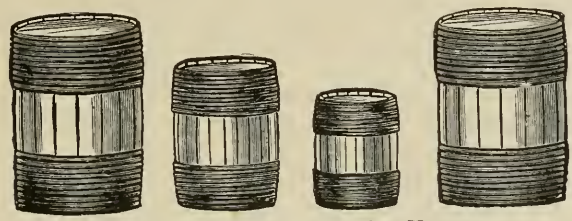


FIG. 30.—*Small Kegs for Honey.*

made of pine. The soft-wood kegs need no waxing. If thoroughly drenched with water a few hours before using, no leakage will take place.

The square tin Cans furnish excellent packages for safely shipping extracted honey. Each Can holds about 60 pounds, and two of them may be shipped together in one crate, as seen in the engraving to the right. There is no leakage in

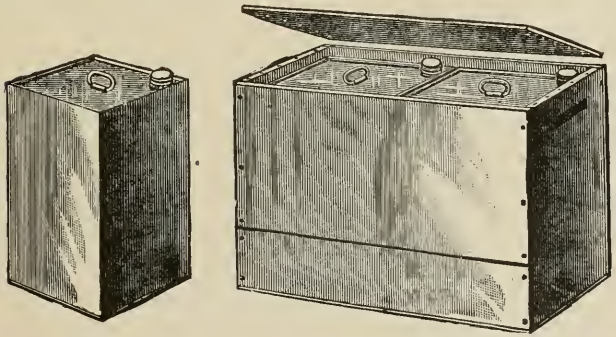


FIG. 31.—*Square Cans for Shipping Extracted Honey.*

transit, if even moderately well handled. A stick one inch square should be placed over each Can, before nailing the cover down.

Barrels are too heavy and cumbersome for convenient handling, and too large for rapid sales. No hard-wood barrel is safe to put honey in, till after it has been thoroughly waxed. Taking into account the value of the wax and time consumed in applying it, together with the price of the barrel, the cans or kegs are the cheapest, without considering their convenience and less liability of leakage. As the jobber never pays for the barrel, the shipper should use the cheapest—if the best.

Many times jobbers and commission dealers decline small sales, rather than furnish smaller packages and give the time requisite for dividing up a large barrel of honey. The time is rapidly approaching when there will be a discrimination of at least one cent per pound in favor of the small packages, for the finer grades of extracted honey, whether for retailing or manufacturing purposes.

HONEY MUST BE RIPENED.

The nectar gathered from the flowers cannot be called honey until the evaporation and ripening process has so far gone on that the bees have commenced capping it over. If it be extracted before it is capped by the bees, as some apiarists recommend, on account of the quantity being thereby greatly augmented, then it should be ripened before it is placed in tight packages or shipped, or it is liable to ferment and sour.

The bee-keepers of California find it necessary to extract the honey as fast as it is gathered, but they thoroughly ripen it. Mr. Gridley thus describes his plan of ripening honey:

FIG. 32.—*Honey Evaporator.*

"The honey from the extractor runs through a galvanized iron pipe (one-and-a-fourth inch) drain, a distance of fifty feet, emptying into a pan, 3x6 feet, four inches deep, made in this manner: This pan is put into a wooden case and covered with a glass sash; set it at an angle of about forty-

five degrees. The honey runs around these partitions, back and forth, a distance of one-hundred feet before it reaches the outlet at the further end; from there it passes through ten feet of pipe into the tank, containing one ton. By the time it reaches the tank, the water is pretty well evaporated."

METAL CORNERS FOR CRATE COVERS.

Mr. W. H. Fletcher, of Sauk Rapids, Minn., has made a very simple little contrivance for attaching to the corners of

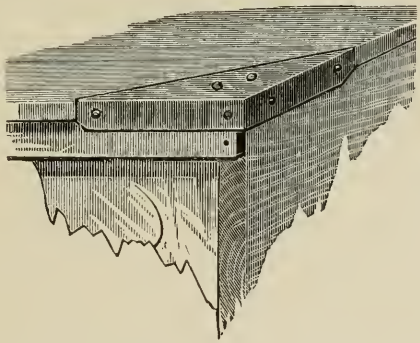


FIG. 33.—*Metal Corners for Crate Covers.*

crate covers. These can be made of tin, require no especial ingenuity to manufacture, are easily tacked on the corners of the covers, and will be found very convenient by the grocer or family to hold the cover exactly in place, thereby effectually excluding flies and bees from the honey. Fig. 33 illustrates a section of the crate and cover with the tin corner attached.

PUTTING THE GLASS IN THE SECTIONS.

This is not such an easy matter to do, especially without some tool to drive in the tin points. Mr. C. Wurster, of Canada, has made a tool to do this (fig. 34), the use of which he describes as follows: "When using the tool, the section must be laid down flat, lay the glass on, and the side of the section you wish to drive the points in should be nearest you,

then with your left hand hold the section and glass in place, and with the left hand thumb to steady the tool, having, as will be noticed, one jaw shorter, which must be facing the glass in front of it, keeping the tool close to the edge of the

FIG. 34.—*Tool for Glassing Sections.*

glass, and, while pressing down with the left fore-finger, press the glass against the tool, or at least from pushing it off in case a point is a little faulty and sometimes apt to bend.

HONEY AS A COMMERCIAL PRODUCT.

With a ready and anxious market for our comb honey in England, France, Germany, China and Japan, as eager consumers of American extracted honey, all fears of overstocking the market are happily set at rest, and the time is not far distant when prices will be as quotable, and as generally uniform as for any other product. Nor need we fear a divided market by reason of Foreign competition, for no country in Europe is so greatly favored by nature for honey producing as is the United States, and none produces honey of finer quality.

Time was when prejudice militated greatly against our sales abroad, but the cultivation of fraternal relations with our friends in Foreign lands, and the assurance of friendly feelings and honorable transactions, have turned their honest prejudice into esteem, and their jealousy into generous co-operation.

Our faith in the future of honey as a staple article, like butter, cheese and eggs, is strong and invincible. To this we have devoted our time, energies and means, and we are fully aware that all our "earnest work," as well as that of our co laborers, will be rewarded. Let us all be wide awake —for "the day of prosperity" for our chosen avocation is just dawning.

MANAGEMENT OF AN APIARY.

LUCK OR SCIENTIFIC MANAGEMENT.

While some are said to be lucky with bees—others could never have any luck with them. Some will not sell their bees, others will not even give them away! Still others will neither sell nor give them away, but will allow them to be stolen, if sufficient money be left on the stand to cover their value. Some superstitious ones contend that when a member of the family dies, some one must go and whisper it to the bees or they will do no good afterwards. A host of other whims could be arrayed, belonging to the age of superstition. Practical knowledge is the only secret of success. Stock-growers say, if they want to raise good stock they must attend to them, and administer to their wants. This is precisely the case with bees, and is the sole secret of that success which the ignorant and lazy ascribe to luck.

THE ITALIAN BEES.

Briefly stated, their superiority is thus demonstrated:

1. They have longer tongues and gather honey from the flowers where black bees cannot.
2. They are more industrious and persevering, and with the same opportunity will gather much more than black bees.
3. They work earlier and later in the day, as well as in the season, often gathering stores when the blacks are idle.
4. They are better to guard their hives against robbers, and proof against the ravages of the bee moth's larvæ.
5. They are more prolific in the spring, and are less liable to breed in the winter.
6. Queens adhere more tenaciously to the comb.
7. They are amiable, and it is easy to manipulate them.

ITALIANIZING OF THE APIARY.

To do this, a tested Italian queen (Fig. 1) should be obtained from some RELIABLE dealer or breeder, and introduced into one of the best colonies of the apiary. For, as the queen is the mother of the colony, to change queens is to change the whole character of the colony in a short space of time. To successfully

INTRODUCE A QUEEN

it will be necessary to find the queen to be superseded and take her away. A black queen being easily frightened, will hide or run away to some corner, therefore it is best to proceed cautiously and without jarring.

In the middle of the day, when the old bees are at work, open the hive, taking out the centre frame, examine both sides, and if the queen is not there, proceed with the adjacent frames till she is found. If not successful the first time,

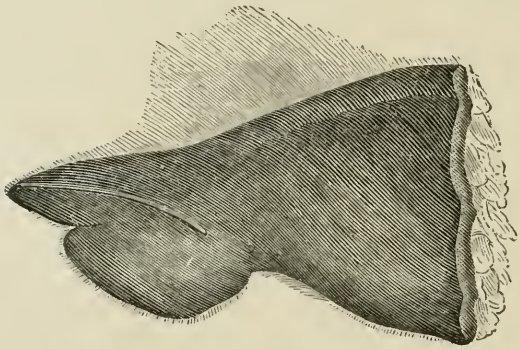


FIG. 35.—*Mandible of Queen, greatly magnified.*

close the hive an hour or two, till the bees become quiet, and then repeat the operation. An Italian queen would be easily found, but the blacks are more troublesome. When found, either destroy her or make such other disposition of her as may be desired; cage the Italian queen and insert it between two combs containing honey which the queen may be able to reach at pleasure.

Fig. 36 gives a good illustration of a piece of furniture that will be found very useful in an apiary. It is a stand on which to hang the first frames removed from a hive, when an examination of it is made. It was made by Mr. J. M. Valentine, who describes it so minutely that one can readily make it. Usually the first frames are leaned against the hive, standing upon the ground, and more or less bees are injured. With this "Stand," they are hung up, entirely out of danger.

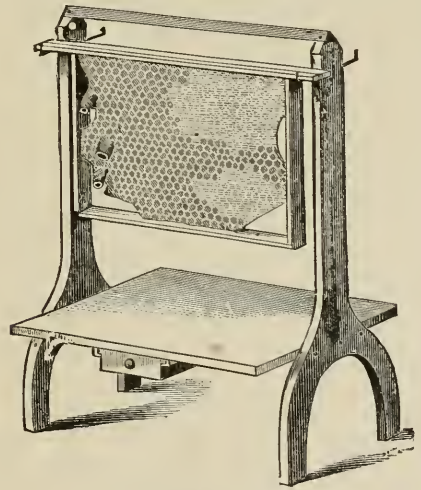


FIG. 36.—*Valentine's Frame Stand.*

"The uprights are $1\frac{1}{2}$x$\frac{7}{8}$, 24 inches high; a piece 1 inch square runs across the top for a handle to lift it by and to hold the top together. Two inches below the top-bar are hooks on both sides, so as to hang on two frames if desirable. Four inches below the bottom of the frames (when suspended on the hooks) is a shelf 12 inches wide, to which the uprights are nailed. This makes a nice place on which to lay cages, etc. Under this shelf is a drawer 6x8, that draws out on either side, in which I keep a dozen queen cages, a sharp-pointed knife, and a small pair of scissors."

In about 48 hours release the queen upon one of the combs,

and see how she is received. If she is attacked by the bees, molesting her wings and legs, return her to the cage for another 36 hours, after which she will, no doubt, be accepted. Queen cells, if any have been started, should be destroyed.

Another plan, and one that is regularly practiced in our apiary with uniform success, is to make the colony queenless for 24 hours, and then with an Atomizer (Fig. 37) throw a fine spray of peppermint water over both the queen and bees, letting the queen loose upon one of the central combs, and close up the hive. The peppermint water makes the bees

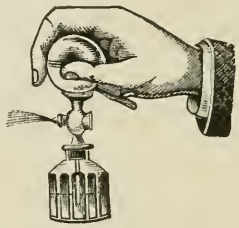


FIG. 37.—*Atomizer, for Spraying Bees.*

and queen of the same scent, and, almost invariably, she is received with favor. The spray is so FINE, that it is not the least detriment either to the bees, comb, brood or honey.

With a valuable queen, where it is not desired to take the least risk, a new colony may be formed, by taking hatching brood from several hives. Being ALL young bees, the queen will be unmolested This may be done with perfect safety.

INSERTING A QUEEN CELL.

A ripe queen cell will almost invariably be received with favor by a queenless colony. Of course all other queen cells must be destroyed.

Fig. 38 shows a queen cell finished and sealed, containing an embryo queen. The orifice *a* is capped, and the cell-walls are thickened preparatory to being extended in the direction of the dotted lines *b b*.

When the embryo queen is nearly mature, within 12 to 16 hours of emerging, the bees begin to demolish the exterior compartment (Fig. 38, *b b*), reducing it to a level with the outer edge of the cap of the cell proper (Fig. 38, *a*). The con-

vex cap, being then very prominent, is liable to be injured; and, to protect it, the bees coat it with a fresh layer of wax, making it nearly as thick as the cell walls. Fig. 39 shows the cell as seen after the anterior compartment has been removed, exhibiting the convex cap *a*.

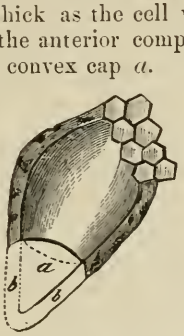


FIG. 38.—*Finished Queen Cell, sealed over.*

The young queen pierces a hole through the edge of the cover (Fig. 39, *a*) with her mandibles (Fig. 35), and then makes a circular cut along its periphery. Being thus detached from the cell walls, the cap drops, opening a circular passage, through which the queen emerges.

To cut a queen cell out, commence on each side of the base of the cell, not nearer than half an inch, and cut upwards a wedge-shaped piece (see Fig. 11), being careful not to squeeze

FIG. 39.—*A Ripe Queen Cell.*

or even to handle the base of the cell. A similar wedge-shaped piece must be cut out of the frame of comb that it is desired to put the cell into. Then carefully place the cell into the hole thus made, fitting it securely in position; place the frame into the hive and close it up.

MAKING NUCLEI COLONIES.

Nuclei are made by taking two or more frames, as may be desired (at least one of which should contain brood), with adhering bees, and the frame, already furnished as described, with a queen-cell, and shaking into the hive the bees from one or more frames, so that there may be enough young bees to remain after the old bees have returned to their former hives, to keep the temperature sufficiently high to hatch out the brood, as well as to care for the emerging Queen. In making up nuclei colonies *be sure not to take away the Queen* with any of the frames, else the cell will be destroyed, and all their labor lost.

It is better to use the regular frames for nuclei hives, and either use the ordinary hives with a division-board (Fig. 40) to contract the brood-chamber, and economize the heat, or make small hives just to suit the number of frames used.

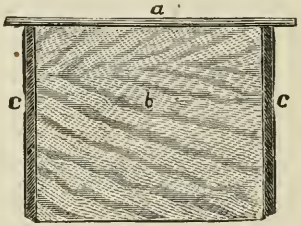


FIG. 40.—*Division Board.*

Many inquire whether there is any patent on the ordinary division-board, or not. We say emphatically, *No !* One man claims a patent on a division-board fitted up with "woolen" or "rubber strips," at the sides, and "lugs," or feet at the bottom. No one need fear to use the ordinary "division-board." A board of *one* piece is neither patented *nor patentable !*

As the virgin Queen emerges from the nucleus to meet the drones, sometimes the bees will accompany her if they have no unsealed brood. To prevent this, two or three days after the Queens are hatched, insert a frame containing eggs and young larvæ in each nucleus. If the Queen should be lost on her bridal tour, the materials will be on hand for the bees to rear another, if it is unnoticed by the apiarist.

When the nuclei colonies are formed, put them away in the shade, and in two or three days the Queen will be hatched, and a week or ten days later will become fertilized, and be laying; this may be readily discovered upon examination. Now the apiarist is ready for the formation of new colonies, without the inconvenience of natural swarming, by

DIVIDING THE COLONIES.

Bees swarm because it is their natural manner of increase. By dividing them we secure the increase without swarming, and save time in watching and hiving natural swarms. This, however, must not be overdone. The beginner sometimes imagines that by dividing he can make almost any number of colonies from each one, forgetting that *strong* colonies are the only ones that accomplish anything. Dividing should never be done unless the colony be very populous, and can well spare the bees and combs. To more than *double* the number of colonies each season is not good, unless increase is desired at the expense of honey.

Some divide their strong colonies equally, or nearly so, carefully looking for the Queen, putting her into the new hive, placing bees and brood in the centre, filling up with frames containing comb foundation (Fig. 69), removing the hive with the Queen to a new location; leaving the queenless colony on the old stand, to rear for itself a Queen from the brood it possesses. If the Queen be a choice one, and it is desired to get Queens from her, it is a good plan to get the queen-cells started for the nuclei, as before described.

Ordinarily, we prefer the nucleus plan of multiplying colonies. Take one of the nucleus hives before described (which should be of the same pattern and size as those to be divided), and remove the division-board. Then take a frame containing brood and adhering bees from each colony, placing them into the nucleus until it is full. Be sure not to take the queen away from any colony. The bees that will hatch out in a few days will make that nucleus a populous colony. Put a frame nearly filled with comb foundation (Fig. 69) into each hive from which the frame of brood was taken, and in a few days they will have this all worked out into beautiful comb; and, in all probability, filled with eggs.

The new colony having a young and fertile queen, and plenty of bees, will soon rival the old one in the vigor of its work Each of the nuclei can be built up in this way, giving a new colony every few days—or, if the apiary be large, several every day—and thus effectually prevent swarming. Increase being secured in this way, none of the colonies are disturbed, and the bees everywhere "pursue the even tenor of their way." All being kept strong in numbers they are ready for the honey harvest, and will work in boxes very willingly.

Dividing should be done in the middle of the day, when the bees are busy in the fields and the yield of honey is abundant.

Another plan practiced with success, is to take away the division board in the nucleus hive, fill the frames with comb foundation (Fig. 29), and exchange places with a populous colony, caging the queen of the nucleus for about 36 hours, or until her acquaintance has been made by the strange bees that come pouring into it from the fields—for bees will always return to the exact spot occupied by their home.

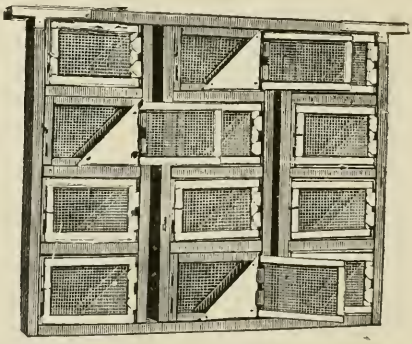


FIG. 41.—*Davis' Queen Nursery.*

To raise queens for the purpose of Italianizing an apiary, the Queen Nursery (Fig. 41), invented by Dr. Jewell Davis, may be used with success. Put into the cages of the nursery, between the tins, a few cells of sealed honey, in new comb if possible. Then cut from the combs of a pure Italian colony as many queen cells, large and well developed, as you have pre-

pared cages with the honey, as above. Suspend one of the cells in each of the cages. Good care should be taken to have the best cells, and not injured by bruising, handling or jarring. Having thus supplied each cage of the nursery with a queen-cell and food—the food is thus supplied that the young queens may not starve if the bees do not feed them, a thing they often fail to do when there is a scarcity of honey in the flowers. The nursery cages so prepared are adjusted in the nursery frame. Then having removed a centre comb from a strong black colony, the queen-nursery may be placed into the vacancy made by the removal of the comb, there to remain until the queens are hatched, which will be in 3 or 4 days, if the cells were not cut from the combs too early, or before the 9th day. When the queens have emerged from the cells, remove the cage and introduce the caged queen to a black colony, liberating her on the next day about sundown—if necessary, spraying the bees with perfumed water by the atomizer (Fig. 37).

FIG. 42.—*Queen-Registering Slate.*

To remember dates every one has not the faculty, and yet all the operations of queen-rearing require that it should be done. For instance, the time when a choice colony was made queenless, to have queen cells started—the time these cells are given to the nuclei—the time of hatching—when the queens commence to lay, &c. To save time and trouble in remembering these and other dates, a small slate (Fig. 42), 3x4 inches, with a hole in the center of the top, should be hung on the hive by a small nail with all these dates written thereon. A printed card tacked on to the inside of the cap is used by some to advantage, in keeping track of such dates.

If the dividing of colonies be neglected, or if it is not desired to practice that method of increase, the bees will become greatly crowded for room, and will necessarily

SWARM.

For some days before swarms issue the bees may be seen clustering at the entrance of their hive, though some come

out where there are little or no indications of a swarm. When honey is abundant, and bees plenty, look for them to come forth at almost any time, from the hours of 10 in the morning to 3 in the afternoon, for first swarms ; for second and third swarms, from 7 in the morning until 4 in the afternoon.

By examining the hive it can be ascertained whether they are about to swarm or not. If queen-cells are seen with eggs or larvæ nearly ready to be sealed over, a swarm may be expected within one or two days after the first cell is sealed over, or as soon after as the weather will permit.

After whirling a few minutes in the air, the mass of the bees will cluster on the branch of some convenient tree or bush—generally one that is shaded from the sun's rays.

They should be hived as soon as the cluster is formed, else they may leave for the woods ; or, if another colony should cast a swarm while the first was clustered, they would probably unite.

Should the Queen fail to join the bees, by reason of having one of her wings clipped, or for any other cause, the swarm will return to the hive, as soon as they make that discovery. As the bees are gorged with honey, they may be handled without fear of stings.

"After-swarms" being unprofitable, all but one of the queen-cells should be destroyed, or cut out, as before described, for nuclei—this will prevent any more swarms issuing. Within eight days, the first Queen will issue, and finding that she has no rival she will take possession of the hive, apparently having no idea of swarming.

To ascertain that she has no rival, she makes a peculiar sound—called "piping." If there is another Queen in the cell nearly ready to emerge, it will answer by a "piping" sound. If this Queen, still in the cell, is protected by the bees, so that the first Queen cannot find and destroy it, she will also prepare to swarm within 2 or 3 days. After the departure of this swarm, and the emerging of the second Queen and her "piping" is also answered by a third Queen, a third swarm may also issue.

If the desire to swarm is satisfied after the departure of the first swarm, the queen-cells will be all destroyed by the first young Queen that emerges.

HOW TO HIVE A SWARM.

If the cluster be low, it is easily performed. The queen is usually in the lower part of the cluster, and by finding "her majesty," and placing her into a hive, which should be placed conveniently near for the purpose of hiving the swarm, and with a dipper, or any other convenient vessel, place the bees down in front of the hive on a sheet, or piece of paper. They will then crawl into the hive, and, finding the queen, be satisfied to remain. When the bees are in, place the hive where it is to remain; a shaded position will be the best. If comb foundation (Fig. 29) be placed into the frames, it will be of very great advantage in comb building.

If they have clustered on a branch or twig, a basket will be quite essential, into which to shake or brush the bees. If on a wall or fence, or on the trunk of a tree, brush them into the basket, and proceed to hive as before described.

A frame of brood and another of honey placed into the new hive will be of much advantage to the bees. The former will prevent the swarm from leaving the hive, and should the queen be lost, it will give them the means of raising another, and the latter will give them a good start. By filling the other frames with comb foundation, (Fig. 29) they will soon be in good condition and perfectly at home in their new quarters.

Sometimes a swarm will make for the woods without clustering—but this is rarely the case.

The beating of tin pans, and all such old-fogy notions, is, of course, of no avail; throwing a stream of water from a fountain pump is often done to bring down an absconding swarm, and cause them to alight and cluster.

THE LOSS OF THE QUEEN.

When the bees manifest a restless and uneasy disposition by running about the front of the hive and signaling each other, it is a sign that they have lost their queen, and they should be examined at once.

Should a colony become queenless from any cause, three weeks may be gained by having an extra queen to give it at once. Upon examination, if no brood is found where the bees are clustering, the colony is queenless. At any time during

the season, from March to October, this is a sure sign. Colonies that lose their queens during the winter have a forlorn appearance. The bees walk around the entrance listlessly and without eagerness; but few of them go in search of either honey or pollen.

No time should be lost in giving a queenless colony a comb of eggs or young larvæ, or both, from which to raise a queen.

FIG. 43.—*Legs of an Italian Worker Bee.*

Sometimes such a colony will refuse to raise queen cells: it may be too weak; its queen may be too old to lay, or they may have a fertile worker. If it be too weak, it should be united with another colony. If its queen be old, she should be removed and the bees given a frame of brood from a prosperous colony. If it has a fertile worker the most effective way to get rid of it is to break up the colony, dividing it among strong colonies having fertile queens.

Fig. 43 shows the legs of a worker bee. The two at the left showing the outside; while the two at the right exhibit the appearance of the inside of the legs, *i. e.*, that part nearest the body. Those at the top of the engraving are the anterior, and the lower ones are the posterior legs; the latter showing the "pollen baskets" at A, A.

Worker bees being undeveloped females, it is not strange that now and then one may be sufficiently developed to lay eggs. Some account for this by the possibility that the larva

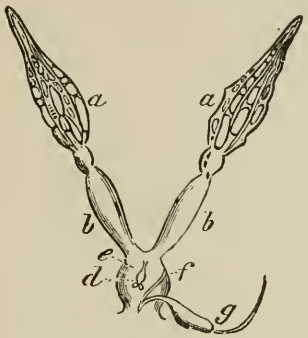


FIG. 44.—*The Ovaries*

may have been adjacent to the queen cell and received some of the royal pabulum, given so plentifully to the queen.

Prof. Leuckart remarks that "it results entirely from the development of egg-germs and eggs in the individual ovarian tubes—which proceeds precisely in the manner described in the case of the queen." As they are incapable of meeting the drones and becoming fully fertilized, their eggs will only produce drones. Fig. 44 presents a view of the genitalia of such a bee. It differs from the queen merely in the more advanced development of the ovaries. (Fig. 43, A A).

workers deposit the eggs in a very irregular manner, caused by the tubes being very imperfectly furnished with eggs.

TRANSFERRING BEES.

June is the month of swarming in the Northern States, while in the Middle and Southern States the early and abundant bloom signal its advent. The best time to transfer bees from the common to movable-frame hives is about the season of swarming, though it may be done on any warm afternoon, when the bees are actively at work.

A transferring board (Fig. 47), about the size of the frame, should be prepared in advance, by making grooves of about one-half an inch wide and one-fourth of an inch deep, and about 2 inches apart. The spaces between these grooves should be cushioned with several thicknesses of cloth, to prevent the brood from being injured when the comb is laid upon it.

Transferring sticks (Fig. 46) should be prepared from some light, tough wood, about one-half inch longer than the frames

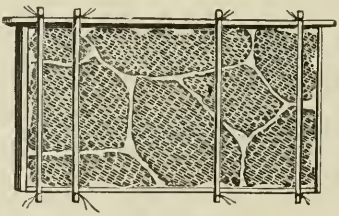


FIG. 45.—*Frame of Transferred Comb.*

are deep, and about one-fourth of an inch square. Fasten two of these sticks together with a piece of fine annealed wire, so as to leave about one inch of space between them, (Fig. 46); attach a piece of wire to the other end of one of the sticks, (Fig. 46, *b*.) to be used in fastening when placed around the frame of comb. (Fig. 45.) A small notch should be cut to admit the wire, and prevent slipping.—These sticks should be made in pairs, and be kept ready for use.

TRANSFERRING FROM A BOX-HIVE.

After smoking the bees at the entrance of a box-hive, remove it some distance from the old stand, leaving an empty hive or box in its place, to receive the bees that

return from the fields ; invert the hive, place an empty box or hive over it, of the same size and shape, wrapping a sheet or cloth around where they come together, leaving no cracks large enough for a bee to escape. By gently tapping the hive for some time, most of the bees, with the queen, will enter the upper box. When they have nearly all left the hive, place the upper box with the bees on the old stand.— Being alarmed and filled with honey, they may be handled without fear.

The old hive may now be removed to a convenient room or building, and taken to pieces, by cutting off the nails with a cold chisel and prying off the ends, cutting the combs when taken out as near as possible to the size of the frames to be used. The transferring board (Fig. 47) should be placed upon a table or box, to be in a convenient position for working over it.

The pieces of combs containing honey may be placed at one side till some with brood are found ; this should be put upon the transferring board (Fig. 47), so that when the frame

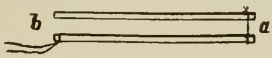


FIG. 46.—*Wired Sticks for Transferring.*

is placed in position over it, the brood may be nearly in the same position as it occupied in the old hive and near the top of the frame, as that will be the warmest position in the hive. With a honey knife (Fig. 28) cut these combs to make them fit. If more are wanted to fill the frame, use the combs of honey first removed from the hive. Then push the ends of the sticks, (Fig. 46, *b*,) that have no wire attached, through the grooves, from the bottom of the frames, where the combs may need support ; the other sticks attached, place on the top of the comb, and fasten the ends together at the top of the frame, as seen in Fig. 45, to match the fastenings below. Place this frame in the hive, and proceed in the same manner with the next brood comb, and let it occupy the adjoining position in the hive, giving the frames containing honey the outside position on either side. The honey from pieces of comb not used, and especially from all drone comb, should be removed with the Extractor

Carry the new hive to the old stand, and empty the bees out of the box on a sheet, in front of the hive. See that the queen, as well as all the bees, enter it. To prevent robbing, the entrance should be contracted; and in two or three days, when the bees have fastened the combs, the transferring sticks should be removed. Always work slowly with the bees, and avoid jarring.

TRANSFERRING FROM A MOVABLE-FRAME HIVE.

When it is desired simply to transfer from one style of frame to another, smoke the bees well, and after finding the queen and putting her in a tumbler or some secure place, take a frame, and shake or brush the bees off into the new hive; place the frame upon the transferring board (Fig. 47) and cut out the comb; place the new frame over it and cut

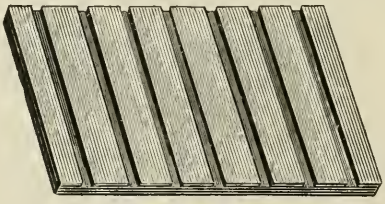


FIG. 47.—*Transferring Board.*

to suit that frame, in the best way possible. Then fasten as before described with wired sticks, (Fig. 46); after thus transferring all the combs, proceed to hive the bees as above directed, letting the queen loose upon one of the brood combs as soon as they are transferred.

UNITING WEAK COLONIES.

Weak colonies may be united after smoking them well, by removing the combs with adhering bees and placing them together in one hive, spraying them with peppermint water by an atomizer (Fig. 38), to give them all the same scent. Give them ventilation and close the entrance till sunset, placing them where the stronger of the two colonies stood. Swarms issuing the same day can be united peaceably.

CLIPPING THE QUEEN'S WING.

This is done to prevent her from leaving with a swarm. In attempting to fly she will fall to the ground in front of the hive, and the bees missing her, will return to the hive. This must not be done until after the queen has met the drone, or she will remain unfertile. To perform the operation, open the hive and lift the frame carefully, and avoid jars; when the queen is seen—with a pair of sharp-pointed scissors, lift one of the front wings and cut off about one-half of it. It is better that she be walking, or at least standing, so that a leg be not cut off with the wing. She should not be handled; if it becomes necessary to pick her up, be sure not to take her by the abdomen. She may be held by the wings without danger.

WASHING OUT DRONE BROOD.

Undesired drone brood can be very easily washed out of the comb by using a rubber sprinkler, which will be found very useful for other purposes about the apiary. All that is

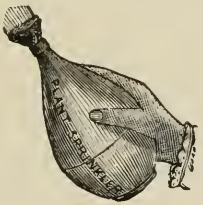


FIG. 48.—*Rubber Sprinkler.*

required being a basin with water with which to fill the sprinkler, and into which the brood may be washed out. To use the sprinkler, compress the bulb, thereby expelling the air; then put the nozzle into water, and it will fill itself.

REMOVING BEES FROM THE COMBS.

The following is the "shaking off process" as practiced and recommended by Mr. G. M. Doolittle: "Place the ends of the frame on the ends of the two middle fingers of each hand, and then, with a quick upward stroke, throw the ends

of the frame against the ball, or thick part of the hand, at the base of the thumb. As the frame strikes the hand, let the hands give a sudden downward motion, which makes the shock still greater. As the frame strikes the fingers again, it is thrown back against the hand, and so on till all, or nearly all, of the bees are off. The principle is that the bee is on her guard all the while to keep from falling off, thus holding on tenaciously so as not to be easily shaken off. By the sudden stopping of the upward, and a quick downward motion, the bees are thrown off their guard and dislodged from the comb. I do not remember of ever having broken a comb by shaking it, as above described. Now, if we disturb the Italians, causing them to fill themselves with honey, they can then be shaken from the combs about as easily as black bees. But even if we cannot afford time to wait till they are filled with honey, four-fifths of them can be shaken off. To get off the remainder, I take a turkey or goose quill and trim down the feather edge about half on the wide side, and with this I have no trouble in getting off those remaining, without irritating them. Of course, it will appear a little awkward at first, but will soon be found easy enough."

PREPARING BEES FOR SHIPMENT.

The best time for shipping bees any considerable distance, is in April, or quite early in May, before the combs are too heavy with brood; but with proper care in preparing them and ordinary usage in handling, they may be shipped at any time with comparative safety, except in quite cold weather.

The first work is to go through the hives and extract about all the uncapped honey, as the least daubing will prove fatal to the bees; then procure a block one inch square, and as long as the hive is wide, in this cut notches and tack in the bottom of the hive, in which to place the frames to keep them steady; now select the new combs and those heavy with brood or sealed honey, secure them well in the frames with strip-binders, and place in the hive; tack the ends of the frames firmly to the rabbets on which they rest; dip the blanket in clean water, lightly wring, fold about six thicknesses, and lay on the front ends of the frames. If the hive has no portico, leave off the cover, and use wire cloth instead, nailing on top

of that, three one-inch strips, two inches wide—one across the center, the others across each end, to insure ventilation when piled on each other. Now tack wire cloth over the entrance, and your bees are ready for shipment.

If the hive has a portico, prepare in the same manner as above, except to bore a one-and-a-half inch hole in each side of the brood chamber, and also in the cover, which will be used in place of the wire cloth over the frames; the holes to be covered inside and outside with wire cloth, to admit of ventilation. Leave the entrance open full size, but cover the entire portico securely with wire cloth, leaving free access to it from the interior of the hive; care must be taken, however, to bore a one-and-a-half inch hole under the roof-board of the portico, and left open, to allow free ingress to the interior of the hive, as the entrance beneath may become choked up, and the cluster of bees, with the queen, die of starvation through inability to get at the honey in the hive. Hives made with porticoes are much better for shipping bees, for it allows them to drag out the dead, cleanse the hive, and, to a great extent, prevent dysentery. Prepared in this manner, full colonies may be shipped at all seasons, from May 1st until Aug. 10th, with perfect success.

Two colonies sent to New Zealand, after being confined six weeks, were received in splendid condition, and are thus described by the consignee, after their arrival: "The hives my bees came in were eight-framed "Langstroth," tin rabbets, bottom board flush with entrance, nailed on to body of the hive, cover flat with one-inch strips, one-and-a-half inches wide, nailed across the top at each end: from one end of cover toward the center, over the middle frames, a piece about 9x5 inches sawn out, and one-inch strips, one-and-a-half inches wide, nailed round the edge on the upper side. This hole was covered with wire cloth on under side, a sponge laid on that, and then covered with wire cloth on upper side, and the cover screwed down. The frames contained old tough comb, and where they had not been built right down to the bottom bar, strips of wood were joined in between the comb and bar, making it secure. Two wire binders were put around each frame, one-third from each end, and in one of the center frames a flat bottle containing water was fastened with wire,

for which a part of the comb had been cut away, next to the end bar; this, of course, was neck downward, corked and some lampwick communicating with the water. The frames rested in a notched strip on bottom board, the width of the hive (not nailed), and two notched strips secured them on top, the cover going down on these, held all firmly. The entrances were covered with wire cloth, and directions for giving water on the sponge were pasted on each hive.

Upon arrival it was found that about a gill of water had been used from each bottle. There was no sealed brood in the hives, but both queens had commenced to lay, as there were hatched larvæ in some of the cells.

UNITING COLONIES IN EARLY SPRING.

Remove the queen from one colony, and put the frames with bees and brood at one side, putting in a divider made by tacking wire-cloth on one side of a brood frame, with the ends extending to reach full length of the hive; now bring the brood, queen and bees from the other hive and place in this one; close the entrance on the bees and queen put in for twenty four hours, slant a board in front, remove the hive vacated, and the work is done. In twenty-four hours, or the next night, remove the obstruction from the entrance, leaving the slanting board in front, which will cause the bees to mark their home anew. On the third day remove the dividing-frame and the board from the front. No hive should occupy the old stand, from which the queen and bees were removed, for several days.

HOW TO SEPARATE SWARMS.

The following is a very successful plan of accomplishing this task. Messrs. Bray & Seacord, of California, say that it works like a charm every time: "Make a box three feet long, wide and deep enough to hang the frames in, from the hive you use; place the frames in the box, same spaces apart as they are in the movable comb hive; make one entrance for the bees on the side of the box, twice the length and of the same height as the entrance to the hive. Make three or four division boards to fit the box, then make a cover with cleats on both sides (no end cleats) to fit the box; hive the swarms

of two or more in the box; place the box in the shade until the next morning, then push the cover lengthwise of the box and you will see each colony clustered by themselves. Put a division board between each cluster, after which push back the cover over the box and set it where you wish to hive the bees. Place the hive in a convenient position to receive the bees, push the box cover back from over the first cluster, carefully drawing out the frames from the box, for the bees build comb twenty-four hours or less from the time hived. On some of the frames you will find comb; place those frames with bees on, into the hive. This will start a roar in the hive; the rest of the bees can be removed with a feather. When all the bees are in the hive, place it where you wish it to stand, and proceed with other clusters in a similar manner."

Mr. J. W. Bailey, of Wisconsin, makes "swarm catchers" of wire cloth nailed to a frame (fig. 49), and thinks them the most valuable assistant for the apiary.

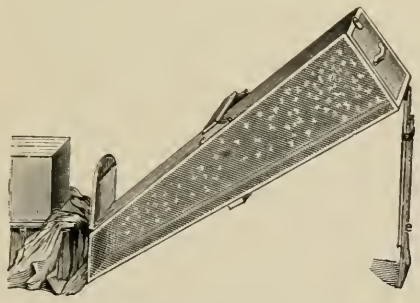


FIG. 49.—*Bailey's Swarm Catcher.*

Mr. J. S. Hill, of Ohio, uses a swarm catcher, the bag of which is made of factory, having a handle of cloth on the inside as well as the out—making it reversible (fig. 50). With a long wooden pole it will reach any swarm, and when the bees are emptied in front of the hive, the handle on the outside gives the apiarist control of it, and when turned inside-out, a handle is still on the outside, as it has two.

ROBBER BEES.

If all the colonies are kept strong there is no danger of robbing. It is only the weak ones that are robbed. Working with bees at unseasonable times, leaving honey exposed in the apiary, etc., induces robbing. Colonies of black bees and nuclei are usually the sufferers. Contracting the entrance, so that but a single bee can pass, is usually a cure for robbing. In times of scarcity of honey, the apiarist should be careful not to keep a hive open long, or robbing may be the result. All strong colonies maintain sentinels at the entrance in times of scarcity. Those of that colony are allowed to pass, but strangers are "arrested on the spot." If a colony is unable to defend itself, close up the entrance with wire cloth and remove it to the cellar, or some other convenient place,

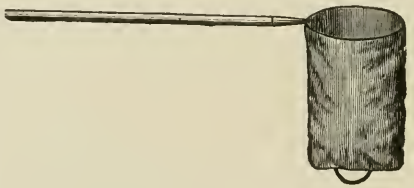


FIG. 50.—*Hill's Swarm Catcher.*

for a few days, and when it is returned to the old stand, contract the entrance to allow only one bee to pass at a time.

FEEDING BEES.

Feeding early in the spring is advisable to stimulate breeding, and keep the colony strong, so that when the early bloom comes it may be strong enough to gather the delicious nectar. Whenever there is any necessity for it, feeding pays; especially in the fall, before preparing for winter, if their stores are insufficient, feed them; each colony should have at least thirty pounds of good capped honey.

Extracted honey, or coffee A sugar, reduced to the consistency of honey, is best for feeding, in the absence of good sealed honey. The poorer grades of sugar and glucose are

totally unfit for feeding bees. To stimulate in the spring, one-half of a pound per day is all-sufficient for a colony.

For feeding inside the hive the division-board feeder (fig. 51) may be used to advantage. It was devised by Prof. Cook, who describes it thus: "The top bar of this division-board feeder (fig. 51) is two inches wide; from the upper central portion, beneath the top-bar, a rectangular piece the size of an oyster-can is replaced with an oyster-can (G), after the top of the latter has been removed. A vertical piece of wood (D) is fitted into the can so as to separate a space about one-inch square, on one side from the balance of the chamber. This piece does not reach quite to the bottom of the can, there being a one-eighth inch space beneath. In the top-bar there is an opening (E) just above the smaller space below.

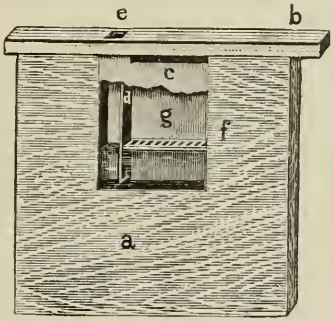


FIG. 51.—*Division-Board Bee Feeder.*

In the larger space is a wooden float (F) full of holes. On one side, opposite the larger chamber of the can, a half-inch piece of the top (C) is cut off, so that the bees can pass between the can and top-bar on to the float, where they can sip the feed. The feed is turned into the hole in the top-bar (E), and without touching a bee, passes down under the vertical strip (D) and raises the float (F). The can may be tacked to the board at the ends near the top. Two or three tacks through the can into the vertical piece (D) will hold the latter firmly in place; or the top-bar may press on the vertical piece so that it cannot move. Crowding a narrow

piece of woolen cloth between the can and board, and nailing a similar strip around the beveled edge of the division-board, makes all snug. The feeder is placed at the end of the brood-chamber and the top-bar covered by the quilt. To feed, we have only to fold the quilt over, when, with a tea-pot, we pour the feed into the hole in the top-bar. If a honey board is used, there must be a hole in this just above the hole in the division-board feeder. In either case, no bees can escape, the heat is confined, and our division-board feeder is but little more expensive than a division-board alone. The best time to feed is just at nightfall. In this case the feed will be carried away before the next day, and the danger to weak colonies from robbing is not so great."

Shuck's Bee Feeder (fig. 52) feeds at the entrance, any time in the day, without danger from robber , as the food can be

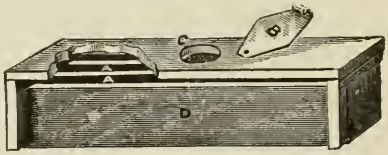


FIG. 52.—*Shuck's Bee Feeder.*

reached only from the inside of the hive; it is placed on the alighting board, with the side (D) nearly covering the entrance. In the engraving, the top is cut away to show the wood divisions (A A) in the feed-cup; the food is poured into it without removing, through the hole (C), which is covered with wire-cloth. When done the cap (B) is closed over it, making all tight.

QUIETING AND HANDLING BEES.

The bee sting is composed of three distinct parts, of which the sheath forms one. These three parts join near the edges, and form a tube which, viewed sectionally, has the shape of a triangle, the angles being rounded off.

The other two parts constitute the sting proper, and in a sectional view are semi-circular (fig. 53, A), the upper edges being thicker than the lower ones, and squared to each other, one of the edges having a projection extending along the

under or inner portion of it, thereby forming a rabbet along which the opposite part freely moves. The under or inner edge of each of these parts tapers down to extreme thinness, while near the termination of the edge there runs a minute groove which corresponds with the ridge mentioned in the description of the sheath, and along which the parts move

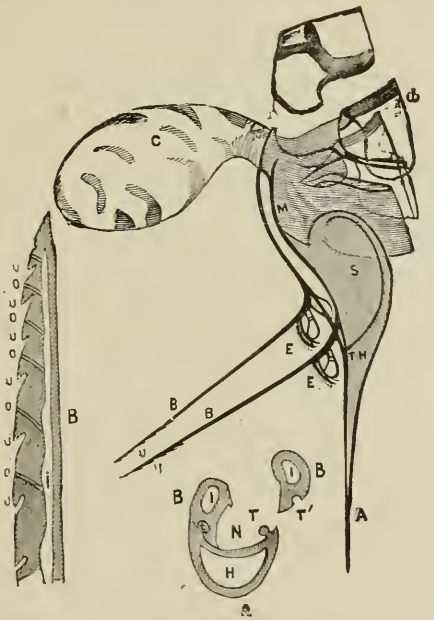


FIG. 53.—*Sectional View of a Bee Sting*

freely. Each of these parts properly tapers down to an exceedingly fine point. Near the point begin the barbs (fig. 53, B), which in some stings number as many as ten, extending along the sting nearly one-half its length, and are well-defined. It may happen that one or both of the chief parts of the sting are left in the wound when the sheath is withdrawn, but are rarely perceived on account of their minuteness, the

person stung at the same time congratulating himself that the sting has been extracted.

On being stung, if the poison-bag has not been emptied, remove it and suck the wound strongly to extract the poison; this is usually sufficient. If not, apply ammonia or salt to the part to prevent swelling. Still another plan used with success is to blow some smoke on the place from the bee smoker (fig. 54).

Smoke is harmless and is the best thing to alarm and quiet bees. With a good smoker (fig. 54), blow a little smoke in at the entrance before opening the hive. Give them a little

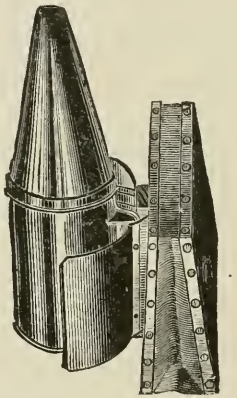


FIG. 54.—*Bingham's Bee Smoker.*

more as you uncover the frames; if very cross repeat the dose, until they yield obedience; then they may be handled with safety. Handle them gently and without fear, avoiding all quick motions; such usually incite them to anger. When honey is being stored rapidly, Italians may be handled without smoke; when there is a scarcity it is not safe to do so.

To those who are commencing, and until familiarity causes the loss of fear, a pair of good gauntlet gloves and a veil are necessary, but after that fear has been overcome, a good veil will be sufficient. Such may be placed over a hat, the bottom of it coming down under the coat or vest, and when thus ad-

justed it is a complete protection for the neck and face (fig. 55). It being made of white netting, it does not stain the clothing, and as the piece over the face is black, it can be seen through, nearly as well as if not worn.

A pair of gauntlet rubber gloves is best for those who need such protection, while unaccustomed to manipulating bees. The advanced apiarist prefers to have the free use of his

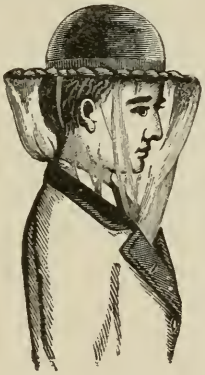


FIG. 55.—*Bee Veil.*

hands at all times. Bees when gorged with honey are very peaceable; when often handled they become accustomed to the practice, and when this is gently done, they will scarcely notice the disturbance.

SHIPPING AND INTRODUCING QUEENS.

Fig. 56 shows a safe introducing cage, which is made by taking four strips of wood about four inches long and three-eighths of an inch square; mortise both ends of one piece half way, and one end each of two others, so as to form a three-sided frame; on this tack fine wire cloth, and through each side-piece drive two three-fourths or one-inch finishing brads, letting the ends project; drive two brads through the fourth or loose strip. Take from the brood chamber a frame of comb containing sealed brood, remove the queen from it, if there; then shake the old bees in front of the hive, and place

the introducing cage on the comb, over sealed brood and a few cells of uncapped honey, letting the projecting nails run through the comb so as to hold the cage firmly and closely on the surface of the comb; then let the queen run from the shipping cage under the wire cloth, and quickly close by placing the fourth strip on the comb at the open end of the

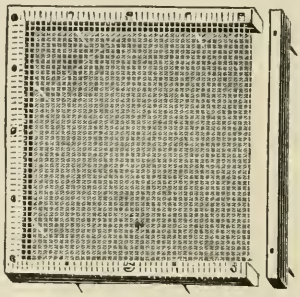


FIG. 56.—*Surface Introducing Cage.*

cage (fig. 56). Replace the frame in the hive, and the work is done. The young bees emerging from the cells affiliate with the queen confined with them, and the newly emptied cells afford room for depositing eggs. At the end of two or

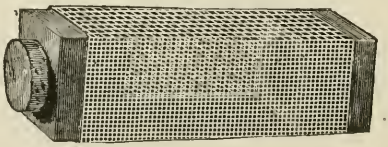


FIG. 57.—*Oatman's Introducing Cage.*

three days she can be released by removing the end strip, and all danger from "balling" is obviated.

Many queen cages are on the market for shipping and introducing queens, and almost all of them are well adapted to the use for which they are intended.

WOOD-ZINC HONEY-BOARD.

This is made of alternated strips of wood (1⅛ inches wide) and perforated zinc (¾ of an inch wide), with one row of

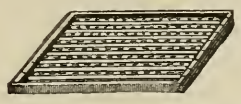


FIG. 58.—*Wood-Zinc Slatted Honey-Board.*

holes. The zinc strips are held in place by fitting into saw-kerfs on the sides of the strips of wood. It can be made to fit any hive.

BEE-DIARRHEA.

Bee-diarrhea in the latter part of winter and early spring is a malady that affects some apiaries. The bees discharge their excrements over the hives and combs, producing a dark appearance and offensive odor. The cause is either fermented honey, improper food, long confinement, or too warm and poorly-ventilated quarters. Give them good capped honey and a cleansing flight. If too cold for this, out-of-doors, take the hive into a warm room, make a box, with the front and top made of wire-cloth or mosquito netting, adjust it to the entrance, so that the bees must enter it on leaving the hive. This will usually prove an effectual remedy.

FOUL BROOD DISEASE.

Foul brood is the rotting of brood in a hive; the caps of the sealed brood appear indented and shriveled, and the larvæ and young bees in unsealed cells become putrid, emitting a disgusting stench.

When the disease has a firm hold, even though it may be possible to cure it, we should advise the total destruction by fire, of the bees, combs, frames and hives, with everything which might harbor the disease. In its primary stages it may be cured in this way: With an atomizer (Fig. 37) spray the hive, bees, brood, honey and combs with a solution of salicylic acid, borax and rain water, repeated on the sixth day. Remove the diseased brood from the hive, and give them capped honey—if not too far advanced, this may give relief.

The following is Mr. D. A. Jones' method: "Remove all the combs not containing brood, extract the honey and boil it, then it is ready to feed back. Render the combs into wax and make it into foundation; boil the frames fifteen minutes, and fill in the foundation again, placing them in clean hives; drum and smoke the bees until they all fill themselves with honey (this is very important, for if some are not filled, they will die when others have plenty); shake off the bees, leaving enough to nurse the brood; place them in a box covered with wire cloth, carry it to a dark, cool cellar or bee house, lay it on its side, and allow the bees to

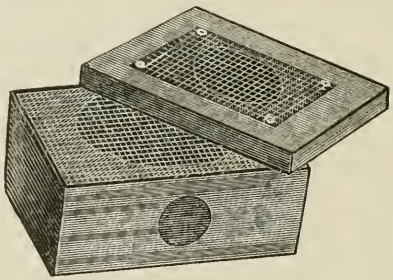


FIG. 60.—*Hastings' Shipping Cage.*

remain there from sixty to eighty hours, until they drop, and show signs of starvation; then shake them into the clean hives with foundation, feed them, and put them into a new location at least one or two miles away from the diseased yard. As soon as the queen and bees are removed for starving, the hatching brood and bees should be doubled up, so as to have all colonies full of combs of hatching brood. The empty hives thus secured should be scalded for future use. As soon as all the brood hatches, the bees may be brushed off the combs after being made to fill themselves with honey, like the first lot, placed in boxes, and treated in the same way. Now bring the first lot purified back to the yard again, and you have all your bees and hives purified and free from disease, if you have done it as it should be done, without any loss except your time."

THE HONEY EXTRACTOR AND ITS USE.

THE INVENTION OF THE EXTRACTOR.

Following closely after the increased knowledge concerning the natural history of the Honey Bee came improvements in bee hives and modern appliances for obtaining the increased production of honey. Major Von Hruschka, a retired Austrian officer, who was then keeping bees in Italy, invented the Honey Extractor; and its great value is everywhere admitted by all progressive bee-keepers.

The following is a brief history of the discovery: One day when the Major, who was a most observing and critical bee-keeper, was in his apiary, his little boy came there to him. The boy had a small tin pail tied to a string, which he was swinging, boy-like, around and around in a circle, holding the end of the string in his hand. The father gave the youth a small piece of comb filled with honey, putting it into the little pail. The boy, after a while, began to swing the pail again as before, with the honey in it. A few moments after, he became tired of that amusement, and put the pail down to talk to his father, who took it up, and, by chance, noticed that the honey had left the comb and settled down into the pail, leaving the comb perfectly clean that had been on the outside of the circle when the boy was swinging it around. The Major wondered at the circumstance, and, turning the comb over, bade the boy swing it again, when, to his great astonishment, the other side of the comb also became perfectly clean, all the honey being extracted and lying at the bottom of the pail. That night Major Von Hruschka, after going to bed, commenced to think the circumstance over; he thought, and thought, and his thoughts troubled him so much that on the morrow he commenced a series of experiments which resulted in his giving to the

World the first honey extractor, which, by whirling, something like his son whirled that little tin pail, gave him the pure liquid honey, extracted by centrifugal force, leaving the honey comb entirely free from the liquid sweet, which he gave again to the bees to fill; allowing him the pure honey for making wine, mead and metheglin, or honey cakes, as desired, without employing the troublesome and primitive method in use up to that time, of mashing up the combs containing the honey, pollen, and sometimes brood, too, to let the

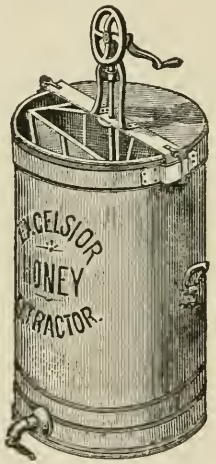


FIG. 61.—*Honey Extractor.*

honey drain through the cloth in which it was placed—giving what was formerly known as "strained honey."

Major Von Hruschka's original and complicated Honey Extractor has been vastly improved in America by Messrs. Winder, Peabody, Murphy, Chapman, Root, Everett, Muth, Coffinberry, and others. Now we have neat and inexpensive machines which do their work well and rapidly, but honey consumers generally have no idea how it is accomplished, and some "old fogy" bee-keepers as well as novices, still ask how it is done.

Extracted honey is obtained by the combs being uncapped and placed in the basket or frame-holder of a Honey Extractor (fig. 62), which being attached to a single rod in a large can and revolved, the centrifugal force throws out the pure honey from the combs, which runs down the sides of the can and is drawn off and placed in jars or some other desirable receptacle. Extracted honey is the pure liquid—minus the comb.

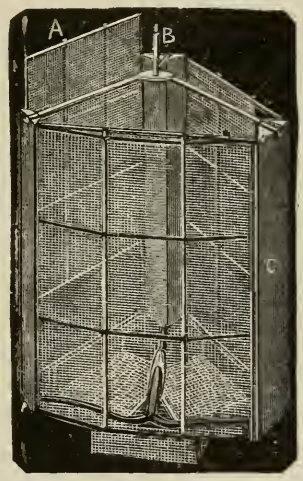


FIG. 62.—*Comb Basket of an Extractor.*

The essential points in a good Honey Extractor are: one that can be easily taken to pieces and cleaned—one that the shaft holding the revolving basket in position, does *not* revolve in the honey—one that has sufficient room below the comb basket to allow the honey to remain and ripen before drawing it off, leaving it clean and free from sediment, and fit for the market—one that has an over-motion and strong gearing so essential to ease of operation and effective work—one that has covers to protect the honey from insects—and one that may be easily operated.

Honey must be "uncapped" before extracting, therefore, a good honey knife is a necessity. Such is the Bingham &

Hetherington honey knife (fig. 63). It is made of the best steel, strong at the bend near the handle, and is wide enough to allow the cappings to remain on the knife while running across the comb. Both edges are sharp and are beveled on the side that comes in contact with the combs. This prevents the knife from adhering to the combs and tearing

FIG. 63.—*Bingham & Hetherington Honey Knife.*

them, while shaving off the cappings. As both edges are alike, it admits of being used for right or left-hand work—the sharp point also allows it to be used in corners or uneven places.

Another and cheaper one is the Muth knife (fig. 64) which, though it is not as desirable, will be used by those desiring an inexpensive knife.

WHEN TO USE THE HONEY EXTRACTOR.

Honey can be extracted, if carefully done, without the least injury to the bees or the comb; the latter may be replaced in the hive, and often are refilled by the bees within three or four days.

When the breeding apartment becomes so full of honey that the queen has no room to lay, to extract it is a necessity.

FIG. 64.—*Muth's Honey Knife.*

By the extractor all the honey can be taken from partly-filled sections—a holder for small pieces of comb (fig. 65) being furnished with some extractors for that purpose, as well as extracting from pieces when transferring. By its judicious use, many pounds of honey can be obtained that would not be completed in the sections by the bees.

Empty combs in the spring are invaluable, and in the fall there are usually many surplus brood combs. By extracting

the honey from these and carefully putting them away, you not only have the honey for use or sale, but also the much-desired combs in the spring.

Inexperienced bee-keepers are sometimes tempted to extract too closely, and thus ruin the colony. The Extractor should only be used when there is a rapid storing of honey, and the outside frames of comb are nearly capped over.—Capped brood will not be injured, but there is danger in using the extractor when the brood is uncapped.

To prevent swarming, the honey extractor is successfully used by some. Its frequent use will usually control it.—

FIG. 65.—*Small Piece Honey Comb Holder.*

Many swarms and large yields of honey will not be obtained during the same season. The one will be at the expense of the other.

HOW TO EXTRACT.

With a good "smoker," blow some smoke in at the entrance of the hive ; after awhile, open it and take out the frames of honey you wish to extract from. Shake the bees from each frame by one or two sudden jars, brushing the remaining ones off. right over the frames into the hive, or down in front of the entrance, with a large feather or small turkey-wing.

Place empty combs or a frame furnished with comb foundation in place of those taken from the first hive. A box, or carry-all, with legs and folding covers, capable of holding about ten frames, and having long projecting handles is very convenient to carry the frames to the operating room. Mr.

Davis, of Tenn., has devised a honey carriage (fig. 66) for this purpose, which combines many useful points.

After carefully removing the "cappings" with a sharp knife (fig. 63) from one comb, place it into the comb basket of the extractor, with the uncapped side outwards; select another of about the same weight, and repeat the operation. A few turns of the crank throws out the honey. Then remove these frames, uncap the other side, and after extracting the honey from them all as before described, place them back into the carry-all, and take them to the next hive to be extracted; perform the same operation, using the frames just

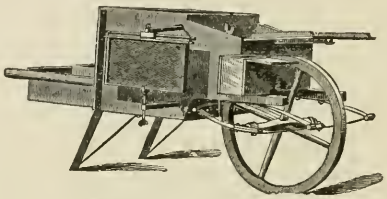


FIG. 66.—*Davis' Honey Carriage.*

"extracted" from, to fill the places of those taken from the hive, and repeat the operation till ALL the hives are treated in the same manner that have a surplus of honey.

By this plan, much work is saved, each colony is handled but once, the bees are less disturbed and will resume work much sooner. If desired, the frames from the last hive may be given to the first, after being emptied of the honey, instead of empty frames—if no extra combs are at hand for that purpose. This is an additional reason why only ONE style of hive should be used in an apiary—so that the frames may ALL be interchangeable. In "dividing," too, this is very essential.

For ordinary sized frames, the comb basket should hold three or four frames (fig. 62), and thus save much labor for the operator. Many of the Extractors are also furnished with an attachment for holding small pieces of comb, obtained while transferring, etc. (fig. 65); this is hitched on to the top of the comb basket for that purpose, and may be instantly either put on or taken off.

COMB FOUNDATION AND ITS USE.

The Bee Hive is an emblem of industry, and the perfection of its government is truly marvelous! When we view the skill exhibited in the building of the beautiful comb—so true in form, so wonderfully systematic in construction, and all completed by a crowd of bees in a dark hive—and often at night, without the light of the sun, moon or stars—we are amazed at the skill of these wonderful little architects! Think of their wonderfully-delicate cells of wax, only 180th part of an inch in thickness, made without the aid of

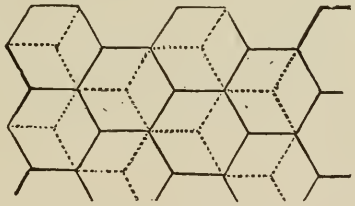


FIG. 67.—*Bases and Cross-Sections of Cells.*

rules, angles or plumb lines—and yet one ounce of this delicate work will contain a pound of honey, of sufficient strength to be transported thousands of miles without injury, with but ordinary care. Contemplate the perfection of these cells. A noted German aptly puts it thus: "The cells of bees are found to fulfill perfectly the most subtle conditions of an intricate mathematical problem. Let it be required to find what *shape* a given quantity of matter must take in order to have the *greatest capacity* and *strength*, occupying at the same time the *least space*, and consuming the *least labor* in its construction. When this problem is solved by the most refined

mathematical processes, the answer is, the *hexagonal*, or six-sided cell, of the honey bee, with its three four-sided figures at the base."

As the bases exactly fit into one another from opposite sides, and the insects work on both sides at the same time, in what language did they communicate the proportions to be observed, while making these bases, common to the cells on opposite sides? (Fig. 67.)

These interesting workers are all arranged and classed so that neither discord nor confusion may interrupt their work.

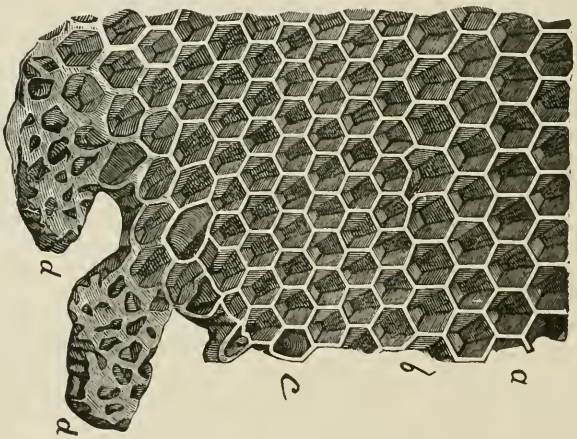


FIG. 68.—*Honey Comb.*

As we have seen—the *comb builders* construct the delicate comb. The *honey gatherers* collect the sweet juices from the flowers and deposit them in the cells. *Water carriers* employ themselves in bringing in the water required for the support of the young brood. The *pollen-gatherers* gather the farina from the blossoms, and carry it in cavities, formed for the purpose, on their legs. The *nursing bees* feed the young bees until these are old and strong enough to take care of themselves; and faithful *guards*, ever mindful of the peace and harmony of the colony, carefully watch the entrance to the hive—admitting no intruder, neither insect nor strange

bee. It is amusing to notice how dexterously they pounce upon anything daring even to approach the entrance.

We are sometimes asked *why* the bees do not build comb when they have nothing else to do, and thus save valuable time, the enquirer forgetting that comb-building and honey gathering are zealously carried on simultaneously, and when the honey flow ceases, comb building is also given up. The latter is chiefly done at night or during unfavorable weather.

THE INVENTION OF COMB FOUNDATION.

It is estimated that the workers consume about twenty pounds of honey, to construct one pound of comb. This being true, one pound of comb is equal in value to twenty

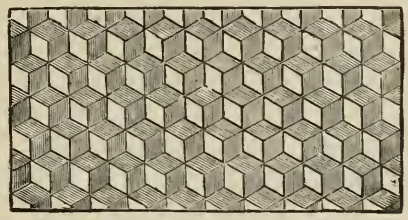


FIG. 69.—*Comb Foundation.*

pounds of honey. If, therefore, honey is worth fifteen cents per pound, comb costs three dollars per pound, when produced by the bees. From this we may learn the value of comb foundation (fig. 69) when supplied to the bees.

This, when only smooth sheets of wax, was first used in Germany, and Mr. W. M. Hoge, in 1874, assisted Mr. Frederick Weiss, an aged German, then living in New York to introduce it to American bee-keepers. In 1875 we visited both of these gentlemen in New York, and obtained some of the first sheets produced. This poor old German has, since then, lived in Chicago, and often visited the office of the BEE JOURNAL. Being poor, old and crippled with rheumatism, he sought refuge in the Cook County (Illinois) Poor House, and there died some years ago.

Comb foundation (fig. 69) consists of sheets of beeswax, formed by dipping wooden plates into melted wax, and upon

being rolled through a machine (fig. 70), have indentations made on both sides that form the foundation of cells, which the bees readily accept and work out into comb.

It would be tedious to review all the various styles of foundation presented to bee-keepers since it was first introduced in America, and the claims of the many machines now upon the market for its manufacture. We have had foundation with triangular-shaped cells, with flat-bottomed cells, with high side-walls, and with no walls at all; with linen, cotton, wood, paper, tin-foil and woven-wire for a base; while latterly, we have had foundation with fine wires imbedded

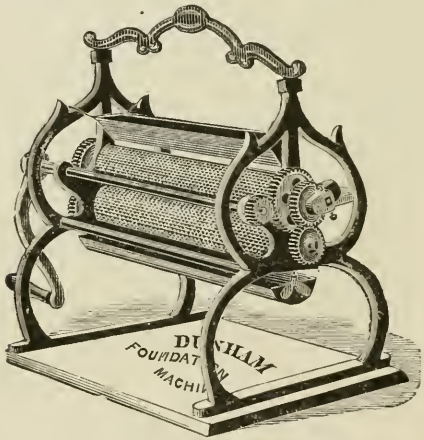


FIG. 70.—*Comb Foundation Mill.*

therein, and frames of foundation with wires pressed therein. Experience is demonstrating, however, that a medium heavy sheet—say, four-and-a-half to five feet per pound, with a thin base or septum, and heavy prominent side-walls or lines, is the most desirable for economy in the use of wax, and rapidity in comb-building by the bees; and whether it be distinguished by the name of Dunham, Given, Bourgmeyer or Ferris—or call it what you will—the above characteristics will be predominent in the comb foundation hereafter used by all progressive apiarists.

Manufacturers should avoid using soap and all other obnoxious preparations in making foundation ; many pounds of good wax have been condemned as adulterated, because of the wash used on the rollers.

Considering the start given to a colony of bees by judiciously using comb foundation, the certainty of having the combs all built straight, the ease with which the number of drones produced by a colony may be controlled, let no one say that we are not making prodigious strides in making bee-keeping a scientific occupation.

PRESERVE THE WAX.

The use of comb foundation bids fair to use all the available wax in the country ; every bit of wax and old combs should therefore be preserved. A wax extractor (fig. 71)

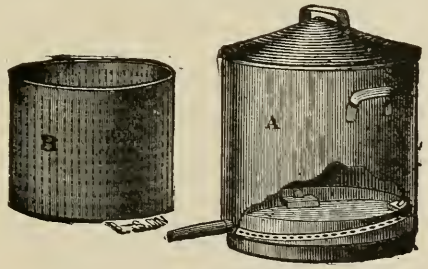


FIG. 71.—*Wax Extractor.*

will soon pay for itself. By its use all the old comb may be saved, utilized, and restored to the bees in comb foundation to be worked out into beautiful comb, forming either the cradle of bees or the receptacle of immaculately-pure honey.

COMB FOUNDATION NOT ARTIFICIAL.

Newton, seeing a falling apple, asked, *why?* Franklin, upon witnessing the lightning's flash, asked, *why?* Fulton, perceiving the force contained in steam, asked, *why?* Thousands of scientific discoveries have resulted from some one asking *why?* When we hear persons call Comb Foundation "artificial," we naturally ask, *why?* Artificial is "*un*natural,"

"fraudulent," an "imitation!" What is there *un*natural about Comb Foundation? Is the wax *un*natural? Does melting, and dipping a board in it, make it a fraud? Does peeling off the cooling sheet of wax from the board make it an "imitation?" Or running it between rollers, or pressing configurations into it, make it unnatural? If so, why do the bees take to it so naturally, instantly seizing it, building it out into beautiful cells, in which to raise their brood or store their honey? Is not everything genuine, natural and real? Then *why*, in the name of common sense, should it be called "artificial?" We much prefer the real, the natural, the genuine, be it ever so plain, to the gilded fraud, or the elegant imitation! Let all ask, *why?* An honest doubt often leads to greater truth!

FASTENING FOUNDATION TO THE FRAMES.

We use Langstroth frames with a V-shaped top-bar; the foundation is just as wide as the inside of the frame from the bottom-bar to the lower point of the top-bar, and is one-inch

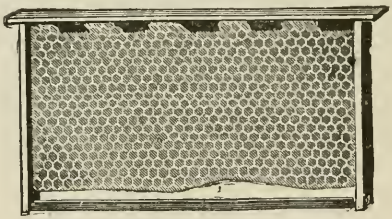


FIG. 72.—*Foundation Fastened to Top-Bar.*

shorter than the frame from end to end. When ready to use a set of frames, the foundation is placed on clean paper, evenly piled, with the straightest edge next to the operator; now with a sharp knife, make four incisions or cuts half an inch long down through the foundation to the paper, and at equal distances from each other and at the ends; with the hands placed at each end of the pile, turn up the two end-cuts with the thumbs, and proceed to the center, which is also turned up; now lift the sheet clear from the pile and turn the two remaining cuts or flaps in the opposite direction;

lay the sheet down with the top edge nearest you, place the frame with the lower or sharp edge fitting closely to the joints, formed by alternately bending up and down the flaps, and press the foundation to the top-bar with the thumbs, drawing to you. When warm and the wax quite pliable, the work is very speedily and effectively performed—scarcely

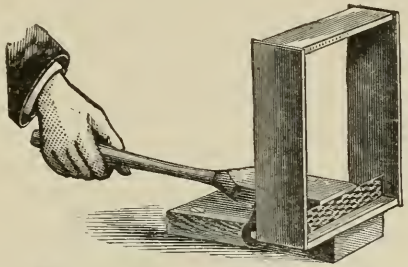


FIG. 73.—*Machine for Fastening Foundation*

requiring more than ten minutes for a full set of frames. The foundation will reach within half an inch of each end-bar and the bottom-bar, and give ample room for the bees to pass from side to side. Of course, a greater number of cuts will do no harm, except to take up more room. With good foundation we have never had any breaking down, warping, nor

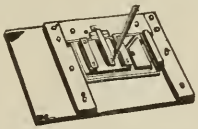


FIG. 74.—*Goodrich's Foundation Fastener.*

sagging to any appreciable extent. Fig. 72 gives a comprehensive idea of the appearance of a sheet of foundation ready for the hive.

Many bee-keepers use a top-bar with a tongue or in-set projecting below its surface, to which they fasten the foundation by pressing with a putty-knife. Others lay the edge of the foundation along the tongue, and fasten by tacking a thin strip of wood over it. Melted beeswax and rosin is used

a great deal, with which the foundation is sealed to the top-bar. Split top-bars are used by many, and possess some advantages over most other kinds. These, however, necessitate considerable labor, as the nailing down of the top-bars cannot be completed till after the foundation is inserted.

Mr. S. Goodrich has invented a machine for fastening full sheets of foundation to the top and sides of frames having flat top-bars (fig. 74).

Starters two or three inches long will not always insure straight combs, but, of course, are much better than empty frames; full sheets are much more satisfactory.

In hiving swarms, if very strong, we would throw them on full sheets and a full complement, to prevent concentrating

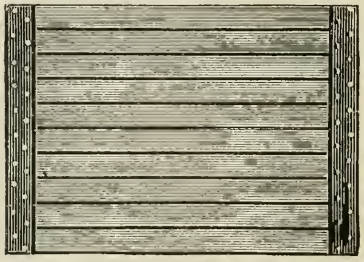


FIG. 75.—*Grooved Board for Cutting Starters.*

too much weight on a few; but if building up, then give full sheets, in the center of the brood nest, only as fast as they can use them.

For cutting it into strips of uniform size, for starters in sections, a grooved board (fig. 75) may be used; the distance between the grooves corresponding to the width of the strips desired to be cut. Several kinds are now made so thin that it can be used to advantage in surplus honey. If natural comb be used in surplus, IT MUST be new and nice. Any other is but a damage to its sale as well as to its flavor.

Bees bred in new comb are generally much larger than those reared in old. The cells in the old comb become smaller every year, as every bee that is hatched in them leaves its silky cocoon adhering to the walls of the cell, thus diminishing its size, and, consequently, the size of the bee.

BEE PASTURAGE A NECESSITY.

As civilization, with its improved and perfected machinery, clears away the forest trees and upturns the prairie sods, it is year by year lessening the productive honey field for the bees, and gives rise to the frequent remark that bees in cer-

FIG. 76.—*Honey Locust Tree.*

tain localities do not prove so profitable as in years gone by. In many instances the honey yield is not so heavy, and the loss in wintering about consumes the profits; especially is the latter the case where bee-keepers have kept apace with

the improved appliances for depriving their bees of the fruits of their labor during summer, as fast as gathered, but have been too shiftless to provide certain and wholesome nectar-yielding bloom with which to replace the earlier stores taken away. In view of the uncertainty of nature providing sufficient continuous bloom, and the certainty of annually recurring periods of cold weather, and long, hazardous confinement, the bee-keeper, to insure success, should as conscientiously provide pasture from which his bees can gather food, as to

FIG. 77.—*Basswood or Linden Leaf and Blossoms.*

provide hives with which to shelter them from the storms. With a liberal allowance of good, wholesome honey in the fall, the first requirement for successful wintering will be provided. We cannot understand how any one can mistake his duty to provide pasturage, if profits are expected; nor how a humane, generous-hearted bee-keeper, can increase his numbers of bees without making some provision against starving.

TREES FOR SHADE AND HONEY.

Every home can be beautified by a judicious selection of ornamental shade trees, and where the roads, streets and

lanes are nicely bordered with them, the market value of the property will be increased more than double the cost of the trees and labor necessary. For this purpose the basswood or linden (*Tilia Americana*) is one of the most desirable.

FIG. 78.—*Tulip or Poplar Leaf and Blossom.*

Its rank, thrifty growth, large, glossy-green leaves, beautifully perfumed flowers, adaptability to almost any soil and climate, and ease with which it can be cultivated, make it one of the most desirable for lawn or lane. It is easily prop-

agated from the seed or cuttings, and can be transplanted with certainty, and may be obtained with little trouble. It blooms in early July, and yields a white, aromatic honey, of superior quality.

The tulip tree (*Liriodendron tulipifera*), often called poplar, is also of rapid growth, hardy, and easily cultivated. This makes a beautiful shade, and yields an abundance of delicious honey. As a producer it ranks only second to the linden, but being a very soft and brittle wood, is not so desirable for shade.

Box-elder (*Negundium Americanum*) or ash-leaved maple, is very desirable for a shade, and being a hard wood, is quite valuable for its timber. Like the linden and tulip, it is a great favorite with bees, and yields a superior honey. Blooming between the two, and forming a beautiful contrast in foliage, it might be alternated with the others with nice effect.

There are two or three varieties of willows, all good honey-producers, which are great favorites as shades, and are adapted to all sections of our country. The little care required to propagate them, is a recommendation in their favor.

The Eucalyptus or blue gum, will undoubtedly become as great a favorite in our Southern States as it is in California, and is said to be a superior and beautiful honey-producer.

The black locusts should not be overlooked in the arrangement of our selection of shade trees. They are almost certain honey-producers. Although the duration of bloom is but limited, they yield a bountiful supply of rich nectar, and bees will literally swarm among the highly-perfumed blossoms. Hon. G. W. Demaree, of Kentucky, writes as follows regarding the locust: "The time of year in which it blooms nearly filling the interval between the late fruit bloom and the white clover, makes it an exceedingly valuable auxiliary to the honey harvest in the middle states, if not elsewhere. It is a most profuse honey bearer, rivaling the famous linden in quality, and only inferior to the product of the latter in color. Locust honey cannot be said to be dark in color. It is of a rich pale-red color, when in a liquid state; but when in the shape of comb honey, its appearance, if removed from

the hive when first finished, is but little inferior to our superior clover honey. It becomes exceedingly thick, if left with the bees till the cells are thoroughly sealed, and its keeping qualities are therefore most excellent. The trees are planted by the side of fences, in waste places, and on poor, worn-out lands. They may be propagated from the seeds, or by transplanting the young trees from one to three years old. If the ground is plowed in the spring, and the locust seeds planted on the hills with corn, or with other hill-crops, and cultivated the first year, the young trees will grow with great rapidity,

FIG. 79.—*Limb, Pod and Seed of Honey Locust.*

even on very poor lands. In this way beautiful groves can be started, making the land, in process of time, very valuable, in locations where timber is an object, besides giving a perfect sea of bloom, ladened with precious nectar."

Fruit trees of all kinds are eagerly visited by the bees, and yield plentifully of pollen as well as honey. They are entitled, also, to consideration for the value of their fruit productions as well as honey.

Above we have named the more common and most desirable of the honey-producing trees. There are many others which could be planted with profit, but the list gives the names of those which can be grown almost anywhere, and

combine ornament with utility. All are worth the little trouble they cause.

PLANTS FOR FIELD AND ROADSIDE.

Where the apiarist is so situated that a few acres of land can be devoted to bee pasturage, we would advise that such selections be made with a view to answering the double purpose of producing honey, and grain or winter forage for stock. Although convinced that a handsome profit can be realized from land devoted to honey-producing alone, yet all will admit that if a remunerative profit can be obtained from its

FIG. 80.—*Sweet Clover Branch and Bloom.*

cultivation for honey, and any other return be derived from the crop, it is an additional net profit, less the cost of harvesting and marketing.

There are, however, many bee-keepers whose grounds are very limited, but in whose immediate vicinity are lanes and alleys but little used, or waste commons and worn-out fields, which, with little labor and less expense, could be made to give profitable employment to an apiary of one-hundred to two-hundred colonies, thus becoming spots of beauty and sources of revenue, instead of remaining evidences of sloth and a public reproach.

For field or commons our first preference is decidedly given to sweet clover or melilot (*Melilotus alba*). Being one of the hardiest plants we have, it will withstand any degree of winter's cold or summer's heat. and its deep-penetrating and wide-spreading roots, admirably adapt it to any variety of soil, whether wet or dry, sand or clay, loam or gravel. Being remarkably thrifty in growth, it will be found equal to red clover for soiling, and can be successfully grown in locations where the latter will prove a failure. Prof. C. E. Thorne, of the Ohio State University, thus testifies regarding its value as a field plant. "It will grow quite luxuriantly in hard, poor clay, where even white clover will scarcely live at all, and grows much more rapidly than red clover in any soil, while in the soils that are, as is said, 'Clover-sick,' it thrives as well as anywhere. It is a good forage plant for bees and for cattle, and is well adapted for soiling, as it makes a growth of four to six feet during the season, and is said to bear two or three cuttings. A German analysis gives its hay a feeding value of fifteen dollars per ton as against sixteen dollars and twenty-eight cents for very good red clover hay. While red clover, upon which our farming in many sections, and especially in clay lands, depends so essentially for crops of grain, is becoming more and more uncertain. It would seem to be worth while to try this 'fast weed' as a resource for recuperative green manuring, in heavy soils especially."

But its greatest recommendation for the general bee-keeper is the fact that it requires no especial cultivation, thus making it particularly desirable for roadsides and commons. Being a biennial, the seeds possess great vitality, and may be kept over for a long time, and scattered a handful at a time, as opportunity offers, or a bare place develops itself. Where possible to devote even a limited time to its cultivation, the ground may be plowed and the seed lightly harrowed under in the fall with winter wheat, or planted with barley; or in early spring it can be sown with wheat, oats or rye, without detriment to the grain. If wanted, however, in its greatest perfection, it should be planted in drills four feet apart, and once hilled up with the cultivator. Sweet clover blooms and yields nectar continuously in this latitude from

about June 10th till Aug. 1st, when the first seed crop matures, which is succeeded with a new foliage and profuse second bloom about Aug. 15th, and this continues till winter sets in. If a part of the field be mown about July 1st, it will bloom and yield nectar, except when rains are falling or during the prevalence of strong, adverse winds, from the middle of June till past the middle of October—certainly as long a period as our impatient little workers can utilize it; nor will it then cease to "waste its sweetness on the desert air," but after the advent of winter, when all else has passed into "the sere and yellow leaf," its modest flowers will waft a fragrant good-bye to the bees when on their last flight, and leave pleasant memories for their long winter dreams.

H. S. Hackman, of Illinois, commenced the season of 1881 with ten colonies, which he increased to seventy, and obtained 1,200 pounds of surplus honey—1,000 pounds of extracted and 200 of comb honey—equal to 120 pounds per colony, spring count, and an increase to over seven colonies from one! Mr. Hackman, who is an experienced bee-keeper, and whose veracity is unquestionable, in a letter dated Nov. 15, 1881, writes: "Please find inclosed flowers of the sweet clover, picked from the roadside, on the prairie, yesterday, 14th inst. I suppose I owe my wonderful summer success largely to the sweet clover. We had the hottest and driest season we ever had—no rain from June 15th until Sept. 15th. The hotter and drier the more honey, seemingly. Sweet clover, as a weed! Although it has been growing in our roads, on waste land, along railroads, and on our hill-sides for twenty-five years, it does not seem to get into the fields, except where water has carried the seeds into low places."

W. T. Stewart, of Kentucky, says: "Melilot is best sown in the fall, but will grow any time or anywhere, except on a flat rock."

To sum up, it is worth more to the farmer for soiling than red clover, because of its thrifty growth; it is a more reliable pasture for cattle, sheep, etc., than red clover, because it will thrive on soils where red clover sickens; it will yield much more fodder than red clover, because it will stand two or three cuttings; and it lacks but seven per cent. of the

nutritious properties of red clover. We can add, we believe it is worth the cost of cultivation to the bee-keeper, for honey alone, even though he is not the possessor of a four-footed animal, because its flow of nectar is not affected by atmospheric changes, as is the case with many plants, notably white clover and linden, and its honey is second to none.

Alsike or Swedish clover (*Trifolium hybridum*) is also a good grazing and honey plant, and sown in connection with

FIG. 81.—*Alsike Clover.*

dairying pursuits or stock-raising, will prove doubly valuable. Mr. M. M. Baldridge, who has devoted much careful study to this clover, says: "The stem and branches are finer and less woody than the common red, and when cut and cured for hay, it is perfectly free from fuzz and dust. It does not turn black, but remains the color of well-cured timothy. The bees have no trouble in finding the honey, as the blossoms are short, and the heads no larger than white clover.

The blossoms at first are white, but soon change to a beautiful pink, and emit considerable fragrance. It ripens in the latitude of Chicago in the latter part of July, but need not be cut till August, if the weather be unfavorable. The crop of seed is always obtained from this cutting, in which respect it is unlike the common red. It is not advisable to cut this

FIG. 82.—*Alsike Clover Root and Crown, average size, one year old.*

FIG. 83.—*Red Clover Root and Crown, one year old.*

clover more than once each season, but it may be pastured moderately during the fall. When sowed by itself, four pounds of seed is sufficient for an acre; but this is not the best plan to pursue, especially on dry western prairie land. It is much the best to mix it with timothy or common red clover, or both. When thus mixed they are a help to each

other, and two pounds of alsike seed to the acre are sufficient. Alsike clover as a fertilizer, must be as good a plant as red clover, as the roots penetrate much deeper and are more numerous. It is a clover which every farmer can and should cultivate, whether he keeps bees or not, as it is superior to the common red for hay or pasture for all kinds of stock." The seed can now be had at a very moderate price, and it is certainly worthy of a trial.

White or Dutch clover (*Trifolium repens*) is too well known to require particular description, and is associated with too many pleasant recollections to call for commenda-

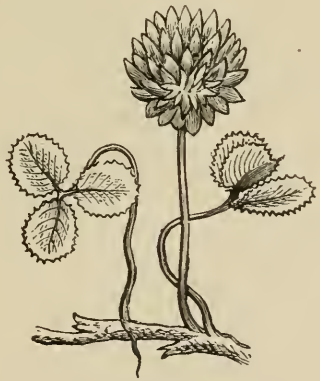


FIG. 84.—*White or Dutch Clover.*

tion. Its modest, unassuming bloom, has hallowed many a sacred spot, and perpetuated enduring virtues long after the earthly form has moldered to dust beneath. The lawn would, indeed, seem incomplete, if still was wanting the clover carpet with its velvet surface of mingling white and green, inviting the weary to partake of rest, and giving out its ambrosial perfume while the grateful bees in myriads sing from flower to flower. For its modest, cheerful appearance, white clover will always be a welcome tenant of waste corners, nooks and roadsides, and no farmer needs be told of its value for pasturage. Its honey is only excelled by that

from sweet clover. Sow the seed in the fall, or in winter on the snow, or harrow in with the spring rains.

There are several varieties of the mustard (*Sinapis*) which furnish honey. These have been extensively cultivated for the seeds alone, and always have a commercial value. The length of season for bloom is quite extended, and where a dearth of honey pasturage prevails, bees will work on them vigorously. They bloom during July and August.

Buckwheat (*Fagopyrum esculentum*) is familiar to every northern bee-keeper. Its value cannot be too highly estima-

FIG. 85.—*Buckwheat in Bloom.*

ted. Its grain always commands ready sale in market, and the honey, though dark and strong, is highly prized for manufacturing and other purposes. It furnishes an excellent winter food for the bees, and when well ripened will enable the producer to avail himself of all the white grades of honey stored earlier in the season. In early morning the bees work on the buckwheat with great enthusiasm, and gather honey from it rapidly; but during the middle and latter part of the day they entirely neglect it, unless the weather be quite cloudy and humid. In the Southern States, we have been

told, buckwheat is worthless as a honey-producer, and, in fact, the same is true of many localities in the Middle and Northern States; but where it does produce honey abundantly, it is well worth cultivation.

There are many other plants which will undoubtedly well repay cultivation for field purposes alone, and yield a profitable *bonus* through the labors of the bees. This of course will depend upon circumstances surrounding the apiarist. In the list can be placed many kinds of fruits, plants, grains and grasses, and much will depend upon the judgment and observation of the bee-keeper.

PLANTS FOR HONEY EXCLUSIVELY.

The catalogue of honey-producing plants is almost without end. Scarcely one but is some assistance, either in furnishing honey or pollen; but observation and judgment will be required to determine the best.

If for the roadside, hillside or commons, where cattle, sheep and hogs run at large, the Rocky Mountain bee plant (*Cleome integrifolia*) is probably one of the best, owing to its immunity from grazing animals. T. J. Dodds, of Iowa, says of it: "Its *habitat* is clay, gravel, rock and limestone. Our river bluffs are carbonate and magnesian limestone, our streets and gutters are macadamized and paved with this stone, and in this the bee plant finds its most attractive home. Hundreds of plants can be found in sight by the writer of this, that will measure five feet in circumference and five feet in height. Through curiosity I went across the street and counted the pods on one stalk alone, out of hundreds of the same kind all around. They numbered 272; the space occupied was 5 ft. 10 inches, height 5 ft. 8 inches; circumference of stalk, 1¼ inches. No rain here for nearly three months, yet they are green, luxuriant and beautiful. No animal will touch them, and they outgrow everything they come in contact with, thus proving the survival of the fittest. Sow the seed anywhere—among rocks, on craggy hillsides, along the highways, in fence corners where nothing useful will grow, and where the winds and rains will spread them, and in a few years your waste places will prove attractive to the eye, and yield abundance of sweets for the table." Seed

should be sown in the fall, when the plants will bloom the next season.

Spider plant (*Cleome pungens*) has been attracting much attention as a honey plant among progressive bee-keepers. It is a beautiful and interesting plant, and produces an abundance of fine honey, but we fear its popularity as a reliable honey plant will never become established. The care required in its cultivation, and the lateness before coming into bloom, will militate against it, so long as there are plenty

FIG. 86.—*Cleome in Bloom.*

equally as good which will be only too grateful for an opportunity to occupy the soil unmolested, and pay their sweet tribute. Spider plant should be sprouted in hot-beds and transplanted.

After several years of careful, close observation, we are more than confirmed in the good opinion we have heretofore formed and expressed regarding the excellence of mammoth

mignonette (*Reseda grandiflora*) as a honey plant. It is a plant of vigorous, rapid growth; having a strong, deep-penetrating tap-root, it is very tenacious in its hold upon the soil, and will grow, and bloom, and yield a rich return of beautiful nectar under the most adverse circumstances; with a sharp, pungent taste, not unlike horse-radish, the foliage is not a favorite resort for spiders or insects. Before white clover has fairly passed its maximum of excellence, the graceful

FIG. 87.—*Mammoth Mignonette.*

and modest blossoms of the mignonette will have won the preference of the discriminating bees. The flowers are thickly studded on the points of curving racemes, and as the base matures its many pods well filled with diminutive black seeds, the point is daily presenting a succession of fresh bloom, which continues until winter has fairly set in, thus providing each fair day a nectar flow, despite the drenching

rains which may precede. It is not unusual to see racemes three feet or more in length. The roots, in taste, are a counterpart of horse-radish. The foliage is not at all similar to *Reseda odorata*, and is said to be an excellent table salad. We hope every bee-keeper will give it a fair trial. Plant early in the spring, in drills three feet apart, or in a hot-bed, and transplant; but the latter method is unnecessary, as it is perfectly hardy and will blossom quite soon enough, with but little care. Do not plant too thick. It blossoms the first season.

FIG. 88.—*Motherwort.*

Motherwort cannot be too highly spoken of for a honey plant, and in the order of progress is destined to become very popular. Its blossoms make their appearance in July, and it remains constantly in bloom till frost, and its green leaves are among the first visible foliage in spring. The stalks are quite large and vigorous, and once well rooted, it blooms and thrives under very adverse circumstances. Like catnip, it is

not a great favorite with grazing animals, and may be planted on the roadsides and commons where stock are allowed to run at large. Four pounds of seed per acre are an abundance, and it may be sown at any time, after which it needs no further attention, and will replant itself. It thrives well among the timber, or in open places.

Simpson honey-plant (*Figwort*) is quite desirable, but of slow growth. The best method of cultivating is by sprouting in hot-beds and transplanting. The growth is slow, but once well rooted, it may be perpetuated for years, and furnishes honey quite plentifully. The plants attain considerable dimensions. The flower is quite small and unassuming, but the stalk grows tall and is very graceful in appearance.

Catnip (*Nepeta cataria*) can be planted any time and any where. It makes a vigorous growth, and possesses much vitality. Bees work on it early and late, and the honey is excellent. Four pounds of seed per acre. It may be sown any time.

We doubt not there are many plants accessible to all bee-keepers, and each adapted more especially to particular or peculiar localities, quite as good as any we have named. But we have already enumerated sufficient from which a very desirable selection can be made for any locality, and all of which will prove very profitable. By all means give each a trial, and select the best for all purposes, after which give those the preference. As farmers are constantly testing the best grains suited to their particular wants, or the best forage for their especial grades of stock, so should bee-keepers be equally generous to their bees, and considerate of themselves and their best interests to give at least a liberal thought to the subject.

HONEY PLANTS FOR DECORATIVE PURPOSES.

Unless actually seen, no idea can be formed of the beautiful and pleasing effect which can be produced by honey plants, when artistically and tastefully arranged. Even the most common of our wild plants, with a little thought and trouble, can be made to transform a very homely lawn into a seeming paradise, and the addition of a column here, with its niches supplied with variegated wild flowers, and a trellis

there, covered with blooming vines attractive to the bees, and now and then a flowery diamond, or a heart or circle, will lend an enchantment to the lawn, rivaling the more expensive exotic displays whose main features are the lavish expenditure of money, and which delight the eye only when first beheld, then become monotonous because planned alone to please the eye.

In arranging the garden or lawn, especial reference should always be studied to present the greatest contrast in colors,

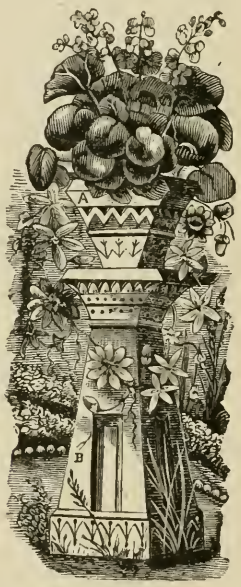


FIG. 89.—*Column for Drive-way or Lawn.*

and yet have them blend in a harmonious whole, so that, let the eye turn which way it will, something new and pleasing will be seen, but nothing abrupt should be presented to startle or tire.

Mr. W. C. Barry, in an essay read before the American Association of Nurserymen, in 1881, truthfully says:

"Gardens are to be seen which have been planned and planted utterly regardless of all rules of landscape gardening. Those who have a knowledge of the art cannot refrain from noticing the blunders that are made, and it is particularly annoying to them to see fine grounds, which might have been rendered exceedingly interesting, utterly ruined by injudicious planning and planting. The owners of such grounds, though they know nothing about gardening, feel that they have made grave errors, but that it is beyond their power to correct them. One of the mistakes most frequently committed, is that of planting indiscriminately—leaving no breadth of turf, and destroying the lawn without realizing any effects from the plantings. If we look about us we shall see how often this occurs; yet it seems very strange that gentlemen who have spent thousands upon a house, would be willing to sacrifice beautiful grounds by careless planting. The same attention and care which are bestowed upon the house should be devoted to the garden, in order that the house and its surroundings may present one harmonious whole. Another common error is that of planting trees which attain large size, in small lots. A tall elm or Norway spruce, or other large trees, is very much out of place on a small lawn. There is no excuse for errors of this kind, for there are numbers of trees of secondary size, which can be employed with advantage."

If the lawn be spacious, a couple of columns similar to the one illustrated on page 120 (fig. 89) can be cheaply constructed and painted, and covered with vines and flowering plants, all affording a rich and continuous field for the bees, and adding wonderfully to the general effect. Fig. 90 illustrates a residence with a narrow front lawn, decorated neatly, but cheaply.

If a pond or considerable depression occurs in the grounds, it can be transformed very easily into a beauty-spot, and be made to contribute to the profits derived from the apiary, as also to the pleasure of the beholder. Where golden rods, wild bergamot, asters, and other honey plants grow spontaneously in the neighborhood, we would give them the preference in cultivating, as they would be hardier, more easily developed, and neighbors not keeping bees would be encour-

aged to foster them for their natural, but hitherto unappreciated beauty. Clumps of pussy or button willows might be transplanted to the grounds with little trouble, and the alder-berry bush would be a beautiful substitute for the popular, but almost worthless, snow-ball. Beds of asters would look delightful, and mints of all kinds, sage, summer savory, sweet alyssum, and many other plants could be used in variegated beds or for borders. By pursuing this course, not only would a taste for flowers be cultivated, but the younger

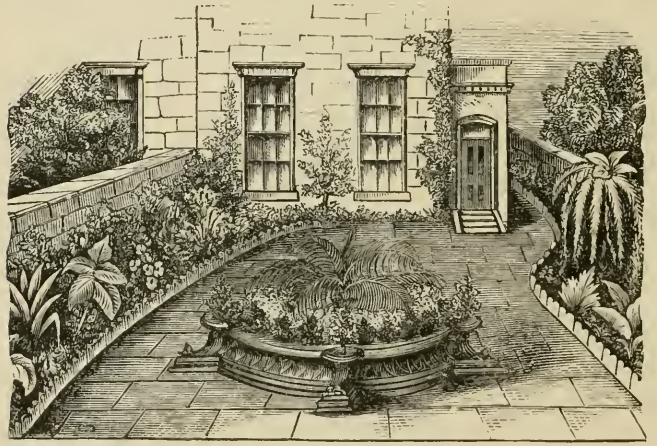


FIG. 90.—*A Floral Lawn.*

members of the family (and the older ones, too) would exhibit a wonderful aptitude for effective floriculture, which in turn would lead to the study and acquirement of a botanical education. This will be found an important and useful accomplishment, to aid in discriminating against obnoxious and poisonous flowers and shrubs, such as foxglove (*Digitalis*), mountain laurel, oleander, etc.

We quote from Mr. W. T. Stewart, of Kentucky, the following very appropriate hints on the subject, which will give a general idea of what to do, and how best to do it, leaving to the gardener the exercise of taste to vary the plans to suit surroundings:

"To make a beautiful mound, or what will appear to be a mound, yet is only level ground, plant that which grows tallest in the center of a ring or circle, next tallest outside of that, and so on down to a creeping ground plant. For instance, you want a mound twelve feet across, six or eight feet high in center, gradually sloping off lower until it is on a level with the ground. You will first mark it off in rings, say eighteen inches apart. Now transplant in the center ring eight or ten fine plants of figwort; it grows six to

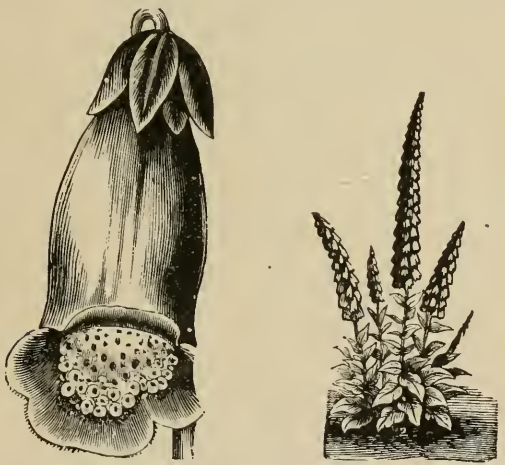


FIG. 91.—*Fox Glove, pretty but poisonous.*

eight feet high, filled with beautiful seed pods as large as buckshot. Next row transplant with goldenrod; grows four to six feet high; then the next row plant in spider plant, which grows three to five feet high, and its pretty pink flowers contrasting strikingly with the golden rod. Next row transplant with motherwort and catnip mixed equally; two feet high; bloom white. Next row plant princess feather; bloom is scarlet and an excellent honey plant. Next row, white mustard; one foot high; bloom golden yellow. Next row transplant peppermint; bloom white. Last row, ground ivy, a creeping vine, and good for bees. This will, when grown

up, appear to be a costly mound, most beautiful to the eye of man or bee. We can make a basin in the same way by reversing the plants, putting the lowest in the center, and so on. By a little study and ingenuity in planting we can contrive many pretty designs that cost nothing, and have every plant to pay nearly as well as vegetables in a garden. Plant in groups of various colored bloom and varied foliage, too, among our bee hives, making them contrast with the color of

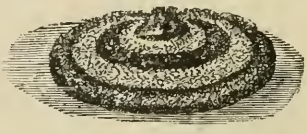


FIG. 92.—*Round Ribbon Flower Bed.*

the hives, etc. Plant a row of basswood, poplar, locust, elm or maple all round the fence, and keep trimmed nicely. Plums, pears and cherries among your hives, for shade, honey and fruit; gooseberries, currants and raspberries can all be made ornamental in the shape of hedges around poultry yards, garden walk, etc., and all are good honey plants, too.

"For trellises, around porches, verandas and windows as a running vine, there is nothing superior to the Clematis for

FIG. 93.—*Diamond Ribbon Flower Bed.*

beauty, shade or honey. Various colored hollyhocks may be used to advantage in grouping or single; it is also a good honey producer, but better for pollen. A few stalks of buckwheat worked in for variety or contrast, does not look badly. Make a border of peppermint on each side of every walk and outer edges of flower beds, and even around the door and gate, so that every time there is any passing around, the clothing or feet will brush against the peppermint. In this way your lawn is constantly perfumed, and you will be surprised to see how much mint you can have growing in this

way, and also surprised to see how the bees take to it through August and September—just when they need it. If you have a low, wet spot on your grounds, plant there a clump of willows. With a group of six or eight willows growing on your lawn, you can make it the center of attraction. By bending and tying them together you can make them grow in every conceivable shape—chairs, ladders, hoops, etc., can

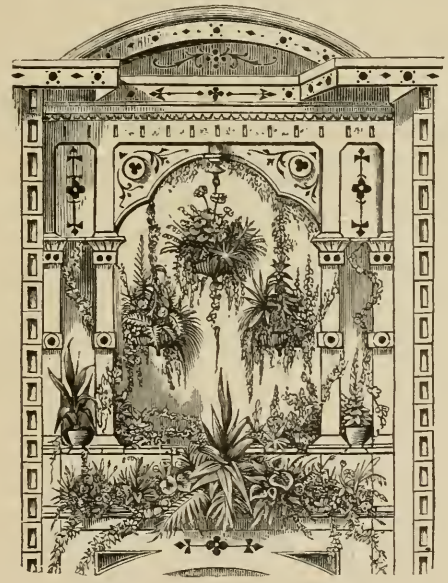


FIG. 94.—*Floral Window.*

be had growing; besides, it is beautiful as a shade tree, and one among the most useful of all honey producers, because it comes so early in the spring, and is full of nectar for early use. Plant a tree of either elm or basswood (twelve feet apart is about right), one on each side of your gate; when they arrive at the right height, bend and tie them together in the form of an arch; keep them tied until they have grown in that shape. An arch over the gate is pretty, and these trees are good for forage.

"Make a ring or diamond of ten feet in diameter and transplant into it dandelions six inches apart all around the outside, then fill up the center by transplanting wild turkey peas, thickly set. This is very pretty; early in spring the

FIG. 95.—*Laying out a Flower Bed.*

bed will be white as snow and the border yellow. Both are good honey producers, and they come so very early that they are quite a luxury for our bees. A hedge all around the fences of motherwort is quite a bonanza. You will notice that most all the plants I have named for ornamenting are

FIG. 96.—*Care of the Flowers.*

such as will only require planting once, and come from the old root for years afterward. Remember, that it is the design and in the ingenuity displayed in planting that attracts the attention of visitors, more than the quality of plants. Common plants, when ingeniously modeled, are prettier than

costly green-house plants scattered helter skelter, without any pretense to form or model. But when you have laid out beautiful models of common plants, your wife will be sure to improve their appearance by the addition of a few pet green-house plants, which are not honey producers themselves. But they will not drive the bees away from those that do produce it.

"When once we have introduced this novelty in our town, we will soon see our neighbors trying to imitate it more or less, because of the novelty of it (not for bee forage). But our bees will go over and appropriate it to their use just the same as if it was purposely for them. But we must keep

FIG. 97.—*Spike of Giant Mignonette.*

still as to the purpose of such a lawn, and let people just think that the novelty of the thing is the main point, if we wish them to appreciate it or pattern after it on their own lawns. If people in general knew that such a lawn was intended for forage for bees, it would lose half its charms in their estimation; but work on, getting up novelties, and say nothing about the bee part of it, and you will see that it is contagious, and people will gradually fall into novelty lawn planting."

The *American Agriculturist* gives, in its March number, 1882, the following excellent advice, bearing upon the subject of selecting the fittest for general honey bloom. We take pleasure in recommending its careful perusal to those

who are locating homes in the treeless Territories which are included in the Act of Congress granting domain for planting forest trees; and especially is it desirable that apiarists in those districts persuade and assist new settlers in making the proper selections:

"From the middle of March, and even earlier, in the far South, to the middle of April, is the time to attend to special planting for bees. As well remarked by Mr. Coffinberry at the National Convention (October, 1881), no subject connected with apiculture is more deserving attention. If each colony of bees in the four to six weeks of storing can give one-hundred pounds of honey to the apiarist, what might be

FIG. 98.—*Head of Goldenrod.*

expected, could they be kept at work the whole season through? The great fall yield from autumn flowers, in Michigan and some other States, suggests the answer. The past season, in some sections, the autumn yield was more than all the rest of the crop. Yet such men as G. M. Doolittle, L. C. Root, and others, if we are rightly informed, get no autumn yield at all. Surely this matter of providing plants for bee pasturage is worthy of consideration.

"Road-side tree planting is attracting much attention at the present time. Dr. Warder, of Ohio, and others, are giving the subject their best thought and study. The Legislatures of some States encourage tree planting by appointing "Arbor days"—days set apart for tree planting, and even by granting homesteads, and exemption from taxes to those

who will devote time to this important work. Why do not bee-keepers see to it that the valuable maples, which furnish early pollen and honey, are accompanied by the still more valuable and equally beautiful basswood and tulip tree, called poplar at the South, and in regions where they will do

FIG. 99.—*Branch and Blossoms of Sourwood.*

well, the sourwood and Judas tree. Would not a little energy secure these trees at least in goodly proportions in the roadside tree planting? No tree excels in beauty the basswood and tulip tree, and the great amount and excellence of the nectar which they furnish is well known. It is wise

in the matter of bee food, as elsewhere, to add as many 'strings to one's bow' as is possible.

"Every bee-keeper may well see to it that waste places along roadsides by railroads, etc., are covered with figwort, Rocky Mountain bee plant, spider plant, catnip, motherwort, and melilot or sweet clover. This last is a most valuable honey plant, but some of our farmers object to it as a troublesome weed. How is this? Many who have tried it say it is not troublesome in the least. If a pest, why did Prof. Thorn, of the Ohio State University, recommend it lately as a good forage plant, and as very desirable for green manuring?

FIG. 100.—*Bed of Marigolds.*

"Bee-keepers should also try to get farmers to sow alsike clover, even if they have to furnish the seed. It will pay both parties largely, without doubt. The mammoth red clover is also a good bee plant.

"As all bee-keepers well know, nearly all our plants fail in times of drouth. True, the mustards and borage yield some honey, but not bountifully. Why should we not try to introduce the famous white sage of California? This plant owes its very existence to its power of resistance to drouth. We may try if it can be grown in the East, and what the result will be in yield of nectar.

"Let me urge bee-keepers not to allow the spring to pass without an effort to do something in the way of culture of special honey plants."

IMPROVEMENT IN BEES.

To obtain the best results we must possess the highest grade of bees that it is possible to obtain. Our object being to elevate the race, no deterioration should be countenanced, and the most thorough and rigid treatment must be employed, all looking to the building up of a strain of bees that will give the best of results.

The queen must be prolific to be able to keep the hive full of bees, to gather the honey harvest when it comes; the bees must be industrious to let nothing escape their vigorous search while gathering the sweet nectar; they must be docile to allow the apiarist to manipulate them with ease and pleasure; they must be strong and hardy, to withstand the rapid changes in climate; and must be of singular beauty, to attract the admiration of the fancier of fine stock.

"The bee of the future" will be present at the very moment when the slumbering flower, under the penetrating dew, awakes to consciousness, and unfolds its buds to take in the first rays of the morning sun. The ideal bee will dip into that tiny fountain, which distills the honey drop by drop, and bear off its honeyed treasure to its cells of virgin comb.

In developing the highest strain of horses, not all their offspring are equal to the best; careful selection of those coming the nearest to the ideal animal must always be chosen, from which to breed, and the closest scrutiny is necessary while making that selection. The same is true of cattle, sheep, hogs, poultry and bees. "Sports" and "variations" continually occur, producing inferior progeny; but all careful breeders who have an eye to the improvement of the race, will reject those that do not come up to the "standard of excellence," sending such animals and poultry to the shambles—so let us carefully select the best queens and drones to breed from, and remorselessly sacrifice all others.

In searching for the best bees, we have tried and discarded the Carniolan, Dalmatian, Smyrnian, Herzegovinian and the Egyptian. In 1866, two eminent Germans, Count Kolowrat and Hern Cori, imported the first Cyprian bees into Europe, but to Italy and America belong the honor of putting forth the greatest exertions to produce the best bees in the World. Did not Signor J. Fiorini, an Italian, make a journey to the Island of Cyprus and to Palestine in search of Cyprian and Syrian bees, to improve the race of Italian bees by crossing, or to improve those races by careful breeding? Mr. D. A. Jones, of Canada, also journeyed to the Island of Cyprus and to Palestine, for the same object; he secured many colonies of Syrian bees, and established an apiary in Cyprus, in charge of Mr. Benton, a brave and fearless American, who (to his honor be it stated) has journeyed through Arabia, India, Ceylon, and the East Indies, and in the face of danger and difficulties untold, in search of some superior race of bees, or some that may be improved by judicious breeding. True, he has not been as successful as could have been desired, but he has planted in Ceylon some colonies of bees from Italy and Cyprus, and if a "cross" of any value can be obtained between these and *Apis dorsata*, or *Apis florea*, he has placed it among the possibilities, in the development of "the bee of the future."

With the different species of bees now at hand from every clime, history will repeat itself—the improved merino sheep but typifies the improved honey bee of the future. For ages the fine-wooled sheep of Spain had been famous, but were not to be had until the French invasion of Spain made it possible. The American merino sheep is a descendant of the best sheep of Spain—but, by the careful American breeder, it is made to yield four times as much wool as the original Spanish sheep. The skillful and scientific breeding of bees promises as great a triumph for America, as the development of that famous ten thousand dollar buck, "Gold Drop."

Dr. J. P. H. Brown, of Georgia, at the National Convention of 1881, reported that the tongues of the Cyprian bees, in a trial of six, aggregated 1-32 of an inch longer than he reached with six of his improved Italians, and they in turn aggregated 3-32 of an inch (one-tenth) longer than the imported Italians.

Equally pronounced is the result of Prof. Cook's numerous microscopical measurements of the tongues of the Syrian bees, which he finds to equal those of the Cyprians, and .006

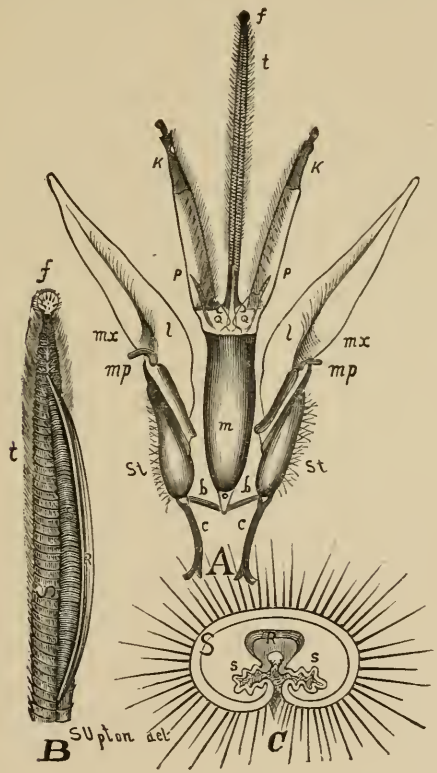


FIG. 101.—*Tongue of the Honey Bee.*

A—Tongue extended; *B*—Ligula, sheath extended; *C*—Cross section of ligula.

of an inch longer than those of the Italian. If the Syrians are capable of as great improvement as has taken place in the Italians up to this time, we may count upon a tongue

more than one-third of an inch in length, which will be sufficient to reach the nectar in the first bloom of red clover.

In 1879 we attended the great Bee and Honey Shows and Congresses of Europe, and took with us some bees from the apiary of the BEE JOURNAL—not to "astonish the natives," nor to arouse the jealousy of those of Foreign climes—but to get a frank and free expression of opinion concerning them from some of the best apiarists of the World. We submitted them to such eminent men as Signors Pietro Pilati and the late Lucio Paglia, two extensive Italian bee breeders; Mons. Dennler, editor of the *Alsacian Bienen Zucchter;* Mons. Ed. Bertrand, editor of the *Bulletin D'Apiculteur*, of Switzerland; Herr Karl Gatter, editor of *Bienen Vater*, in Vienna, Austria; Mons. Ed. Drory, late editor of *L'Apiculteur*, Bordeaux, France; Mons. H. Hamet, editor of *L'Apiculteur*, Paris; Count Gaetano Barbo, President of the "Central Societie d'Apicoltore;" Count Alfonso Visconti de Saliceto, editor of *L'Apicoltore*, at Milan, Italy; the great Dr. Dzierzon; the Countess, widow of the late Baron of Berlepsch; the late Herr Augustus Schmid, editor of the *Bienen Zeitung;* Herr Emil Hilbert; Herr Vogel, and many others, whose names are "household words" throughout the apicultural World—and these American-bred Italians were pronounced the most beautiful bees they had ever examined.

L'Apicoltore for October, 1879, contained the following: "We have had a visit from Signor T. G. Newman, editor of the AMERICAN BEE JOURNAL, and President of the North American Bee-Keepers' Society, who exhibited to us some samples of American-bred Italian bees obtained by constant selection of the best to breed from. They were workers and drones the most beautiful we have ever seen. Their color was of a splendid light yellow; the rings of the abdomen were also yellow, with the exception of the last, which was blackish, yet the sides were yellow. On the corselet, near the junction of the abdomen, they were of purer yellow than we had ever seen on any other bees."

The bee of the "future" will be the one that will gather the most honey, be the most prolific, and, at the same time, the most docile, hardy and industrious; and when produced, whatever may be its color or markings, its name will be *Apis Americana!*

HONEY AND BEE SHOWS.

Public manipulations with bees and magnificent honey exhibits would be the most attractive features of State, County, and District Fairs. There are many good reasons for introducing such, but the chief one, perhaps, is that those who produce honey for the market may be induced to present it in the most marketable shape; for the new methods and new ideas of practical management must take the place of the old and undesirable ones.

It is our aim to make honey a staple product. To this end we have endeavored to popularize the consumption of honey by the masses, as well as to raise the standard of production, by applying correct principles and progressive art to the management of the apiary.

Bees and honey are already the great attraction at such fairs as have given prominence to this industry—and this will become more apparent each successive year. The officers of the St. Joseph, Mo., Exposition were surprised at the result of their *experiment* in encouraging the apiarian department; they realized the fact that it formed the greatest attraction presented by the Exposition.

The editor of the *Gazette* gave his views of the subject in the following article: "Few things last week brought us so many pleasant and profitable things combined—as the display of honey made at the fair, and the lecture of Mr. Newman, of Chicago, on "Bees and Honey." The attention given to the subject this year marks a new era; the display attracted very great attention; good prizes were offered and awarded; the bee-keepers of the region were encouraged, and a more general interest was aroused in the subject. The lecture was very practical, and contained many hints that are invaluable. But practical as it was, the pleasure of the apiary as well as the profit was told; for Mr. Newman is an enthusiast, as, to use his own words, all bee-keepers are."

Mr. Musser, Superintendent of the department, wrote as follows: "The exhibits of last year have worked up quite an interest in progressive apiculture in this vicinity. Many then, for the first time, saw the new apiarian improvements, single comb sections, comb foundation, etc., and had never heard of planting anything for their bees to get honey from. Not one cent in premiums was offered last year, but this year over $120, besides diplomas are offered, and next year I know we can double the amount."

The managers of the St. Joseph Fair, have, by their foresight, given a good example for others to follow, and we hope

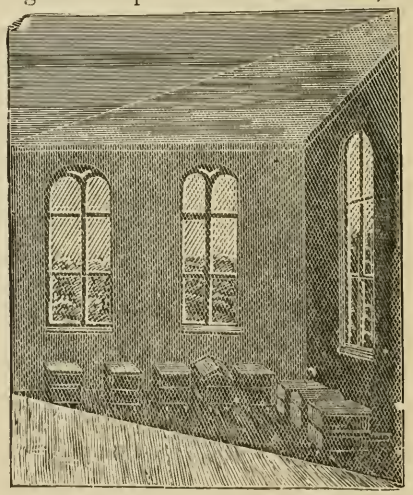


FIG. 102.—*Corner of Building enclosed with Netting.*

the time will speedily come when apiculture, so long neglected by the managers of fairs, will receive its due share of attention. Liberal premiums should be offered for the best exhibits, and these premiums should cover a large variety of special points in order to make the competition the more lively, as well as to enhance apiarian science in general.

Fig. 102 shows one corner of a room on the second floor of a building on the Fair grounds, enclosed by mosquito bar—the hives of bees being inside, with a tube connecting with

the entrances running through the sides of the building, allowing the bees free passage in and out of the hives. Manipulation or examination of the bees, may be accomplished by going inside the netting, and no one outside need be disturbed by the bees. Fig. 103 shows the ground plan of the same corner: A shows the netting; B, C, D, E, F, G shows the entrance tubes to the hives.

When in Great Britain, during the summer of 1879, we found that the most attractive features of the fairs were the public manipulations with bees, and the large display of honey of captivating beauty. There they had a large tent (fig. 104); the inner circle being enclosed by mosquito bar or netting around the sides and about eight feet high, leaving the top entirely open. Around this circle is a passageway,

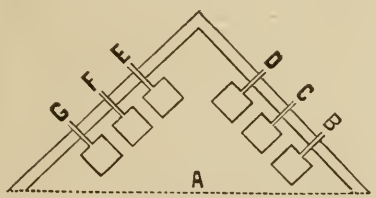


FIG. 103.—*Corner of Building showing Entrance Tubes.*

covered with canvas above and outside, about eight feet high, and six feet broad; in this inclosure the audience assemble to witness the manipulations with bees.

We gave eight half-hour lectures in this tent; each time the inclosure was full of eager listeners. Two of these were delivered at the Scottish Bee and Honey Show, at Perth, concerning which the Dundee *Advertiser* remarks: "The manipulating tent was a scene of great interest during the show. It is of octagon shape, the operator standing in the middle, while the public feel secure under the protection of an intervening gauze screen. Driving bees from a straw skep and transferring their combs to a bar-frame hive, were hourly operations, and never failed to strike with astonishment the spectators, who stood aghast at seeing a human being unprotected turning up a hive of bees, and handling them as if they were blue flies. Mr. Thos. G. Newman, edi-

tor of the AMERICAN BEE JOURNAL, was present, and gave lectures on American bee-keeping, which were very interesting. The Society presented to him a medal as a souvenir of his visit to this country, and for the valuable services he has rendered to the present session of the Society."

For exhibiting bees, observatory hives were used—those having glass sides, through which the bees may be seen at work—the hives being inside the exhibition building, with a tube covering the entrance, and running through the side of the building, giving free passage, in and out, for the bees.

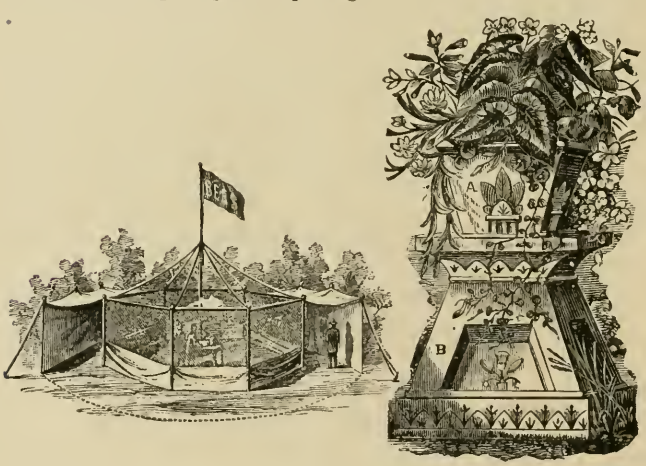


FIG. 104.—*Bee Tent near Column Vase.*

Sometimes, a glass box inclosing each frame, arranged like leaves of a book, with a common entrance to all of them, from the tube running through the side of the building, is made to exhibit bees. This gives an opportunity for thorough examination of the whole colony.

THE EFFECT OF BEE AND HONEY SHOWS.

A correspondent in the London *Horticultural Journal*, says: "I can state without fear of contradiction that never in the memory of man has there been such a desire to keep bees as at the present time. People here have been so encouraged in

bee-keeping as taught in the bee tents, that I have almost daily applications for instructions concerning bees and hives."

A letter from a gentleman in England says: "The American honey introduced into this country in the "prize"

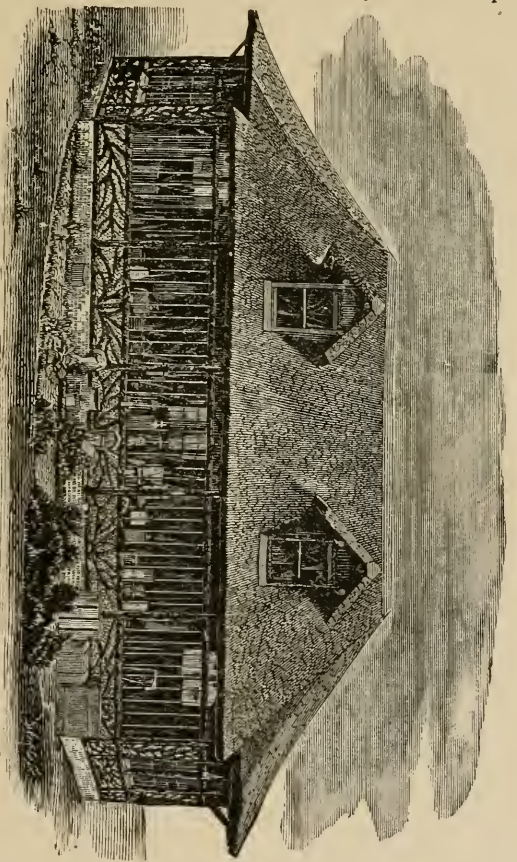


FIG. 105.—*Bee and Honey Pavilion at the Paris Exposition.*

boxes, have exercised a comp'ective influence upon the honey show this year. The season being more propitious than last—the large number of American surplus boxes im-

ported into this country, have gone into use, and the ninety-eight different exhibits, displayed at least a variety never found at an American fair, while the highest prizes in any class, were awarded to the honey in American sections."

Concerning the Toronto Bee and Honey Show, Mr. Wm. F. Clarke says: "Under the stimulus of the liberal prize list, there was a magnificent array of honey. The directors appropriated an entire building to the use of bee-keepers, and for the first time at a great exhibition on the American continent, "honey hall" advertised itself side by side with horticultural hall, dairy hall, etc. Honey was displayed in every form, calculated to make the mouths of spectators water. The tin packages and cans were gorgeously colored and labeled; the glass jars were in various beautiful shapes, and even the wooden boxes displayed a wonderful diversity of taste. In the center was a miniature church, ingeniously built of honey comb and wax, with pinnacles and spire. A smashing trade in honey was done at the exhibition. Thousands of people might be seen with gay-looking tin cans dangling from their fingers, or with pretty glass jars in their hands, or nice boxes under their arms. They bought and carried them home very much as is usually done with toys and trinkets on such occasions. The success of this show awakens great expectations as to the future of bee-keeping in this country."

Of the Honey Show in San Francisco, Cal., the *Semi-Tropic* said: "The attractive display of bees and honey formed a center around which apiarists literally swarmed. One hundred and two varieties of honey-producing flowers, formed a novel and interesting feature of this exhibition. The decorations of white sage were tasteful and appropriate, and the nectar itself, in jars arranged in pyramidal shape, clear as crystal, supported by frame after frame of comb honey, snowy and inviting, made a picture which cannot be photographed except by the artist memory. There were samples of excellent honey vinegar, almost colorless, and above average in acidity; several samples of fruit preserved in honey with undeniable success, and three kinds of honey cake, which elicited the warmest praise from those who were fortunate enough to secure a sample. Fruit cake made with honey is richer and retains moisture much longer than that made of sugar."

THE WINTERING OF BEES.

Notwithstanding much has been said and written regarding the requisites for successful wintering, the problem yet seems unsolved. In Russia, in order to evade the rigors of winter, a deep pit or subterranean vault is dug in the ground, and the "gums" containing the bees are piled one above the other several feet below the surface; then a straw hut is constructed above-ground, over the pit, with a door for ventilation in the leeward side, to carry off the moisture and heat from the bees. If fifty per cent. of the bees survive till spring the bee-keeper feels much encouraged. In our Central and Northern States, cellar repositories seem to have met with more favor than perhaps any other plan; still, some experienced and comparatively quite successful apiarists are found among the advocates of numerous other methods, most prominent of which are chaff hives on summer stands, double-wall hives, frame hives with deep combs, etc.

To account for the many failures of all the popular methods numerous theories have been put forth by the wise ones, while others stand aghast at having had their pet theories proven mere chimeras; and even the most confident look forward with trembling anxiety, scarcely knowing which is the strongest sentiment—hope or fear. Breed our bees up to what standard we may, create a popular demand for honey till it is as eagerly sought after as bread, build up the price till our profits count cent. per cent. when Providence ordains a favorable winter, and yet, with all these, there is a nervous anxiety about the business that is not dispelled till we have passed the last nipping frost of spring. Disguise the fact as we may, until some method for wintering is devised—that is, a method which will prove as safe and certain for a medium weak colony as a strong one; which will at all times give bees access to their stores let them be in what part of the hive they may; that will be as safe in a long, inclement win-

ter, such as 1880-81, as they were the winter before; that will carry a colony through on the lowest minimum of honey; that will be cheap of construction and easy of application—until then, the success attending bee-keeping will be more or less a matter of chance.

All the best apicultural authorities of the present day, as well as those who have gone before, give the following as absolute requisites for safe wintering: 1. An even temperature ranging from 42° to 45°. 2. Complete expulsion or absorption of moisture from the body of the hive. 3. Perfect freedom from outward disturbances. 4. Protection of stores from contact with frost. 5. Protracted isolation from atmospheric changes in spring. 6. Exclusion of light. 7. Sufficient stores for winter consumption. It is generally admitted that with these seven contingencies provided for, there will be no hazard in wintering, and it is further admitted, that no plan so far practiced combines all these essentials.

There have been various devices gotten up, such as chaff-packed hives, porous-wall hives and double-wall hives, many of which have proved very effective during an ordinary winter, and all of which, as a rule, were much better than no protection at all, but with such a winter as that of 1880-81, all methods of out-door packing were more or less faulty, except where all the other requirements were most amply provided for. The winter of 1881-82 was quite to the other extreme—but few periods occurring where more than two or three weeks elapsed without a purifying flight, and bees wholly unprotected seemed to fare quite as well as those packed or cellared with the greatest care.

CHAFF PACKING FOR WINTER.

Under this heading we will embrace all the different methods for wintering on the summer stand. The double-wall hive, perhaps, will convey the best idea, which can be modified to suit the convenience or judgment of the apiarist. The hive illustrated uses the Gallup frame, which is nearly square, the top-bar being $13\frac{1}{2}$ inches long; end bars, $10\frac{3}{8}$ inches, and the bottom bar $11\frac{3}{8}$ inches, making a frame 12x11 inches outside. The body of the hive is square, measuring $18\frac{1}{2}$x$18\frac{1}{2}$ inches outside. D E are reversible cases,

closed on one side each with ⅞ inch boards, and top mounted with metal rabbets. These can be packed with chaff, straw or leaves, and the open side covered with burlaps, tacked around the edges; or the spaces can be left unfilled, forming an air-space between the outer and inner walls of the hive. For wintering on summer stands, these inner cases may be turned, bringing the warm cushions next the bees. This forms an absorbent of inside moisture, and also keeps the bees at an even temperature, being warm in winter and cool in summer. With the Langstroth hive, double front and rear can be used, and by inserting a division-board at each side,

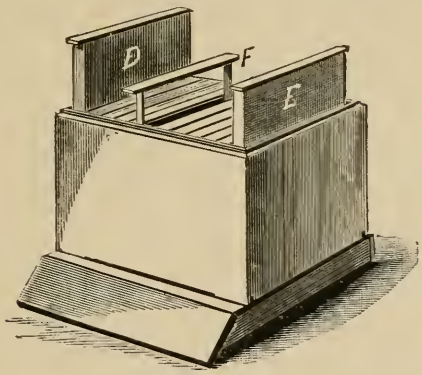


FIG. 106.—*Hive with Chaff Packing for Winter.*

and filling with chaff, or taking out two brood-frames, and slipping down a chaff or straw cushion, the sides will be provided for; then a woolen blanket over, on which a chaff or straw cushion may be placed, and the hive cover placed over all. We like Mr. C. F. Muth's suggestion to bore a hole in each end of the cover, above the packing, to give escape to the moisture from above, and prevent the formation of frost and mold in the hive.

Another method is, to surround the hive with a box some six inches larger, then put the hive in, provide a winter passage out from the entrance, and fill with sawdust, forest leaves or chaff; leaving the cover off the hive, filling in on top, over the blanket or cushion with packing loose, and then

cover the box. In all cases of packing on the summer stand, a passage-way should be made through each comb, a little above and back of the center, or three-quarter inch square sticks be laid over the tops of the frames, to afford the bees a passage from comb to comb, to reach their stores without going to the extreme ends of the frames to pass around.

For wintering on summer stands, all preparations should be made early enough in the fall to admit of ample feeding in case of a scarcity of stores, as they cannot often be fed afterward without great disturbance.

PREPARING THE CELLAR FOR WINTERING.

The first step in this direction. is to be assured that the cellar is sufficiently warm to prevent the freezing of potatoes, apples, etc., and provided with sufficient ventilation to allow of the escape from it of noxious gases and heat generated by the bees. It is wisdom to provide a means of letting in cold air from the outside, should occasion require. Although when unoccupied the cellar may be at a mean temperature of 40° F., if 100 colonies be placed in it they would soon generate sufficient animal heat to run the mercury up to 50°, or even more. The bee apartment should be separate by itself, and not so situated as to be subject to constant invasions by individuals or vermin. The covers should be removed from the hives, one or two thicknesses of woolen or cotton cloth spread over the frames, two or three inch-square sticks laid crosswise of the hive, and the next one set on top and treated the same way, proceeding thus till all are neatly and carefully piled up. This work should not be done till the fall is so far advanced that the bees will be quite chilled, and exhibit but little activity when slightly disturbed. Of course, too much care cannot be exercised to do all your work gently, and if you can do so without the bees knowing they are being moved, it will be much better. When all are nicely piled away, darken every nook and crack, so that should the bees venture to the entrances to the hives, they might think it a perpetual night. At least every fortnight enter your bee apartment with a dark lantern, and satisfy yourself that all progresses favorably. If the thermometer indicates above 45° F., admit cold air at night; if below 40° F., partly close the escape, to bring the mercury up to the desired temperature. Be cer-

tain, before winter has come, that all are provided with thirty-pounds each of good honey, and they are provided for a four month's repose.

HOUSE FOR WINTERING BEES.

Mr. W. L. Drake has invented a triple-walled house for this purpose, and to be used for a dairy house in summer. The house is built of brick. The illustration gives an end view of the house, with door closed and air-supply drafts

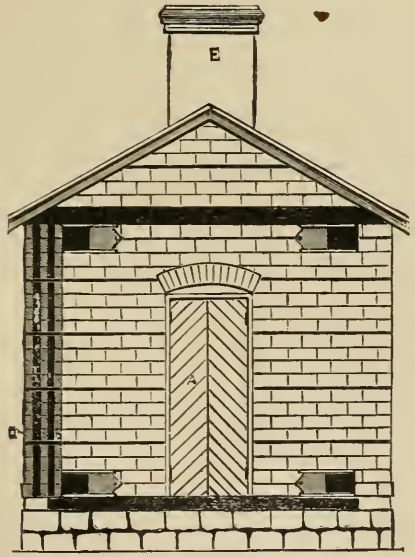


FIG. 107.—*Triple-Wall Winter Bee House.*

open. O, gives a view with the corner bricks removed, exposing the air-spaces in the wall. The outer air-space completely envelopes the middle and inner brick wall, and is intended for a circulating air chamber. The inner space is a dead-air chamber, completely enveloping the inner wall, and entirely disconnected from the outer air chamber. E is a flue connecting with the body of the room, for the purpose of

drawing off the heat and permitting the escape of noxious gases generated by the bees. It will be observed the flues or dampers connected with the outer or circulating air chamber can be opened or closed at will, to regulate the temperature in the outer space, and this again can be discharged in the main room by means of flues piercing through and independent of the dead air or second space. The floor and ceiling are each double, air-tight, and connected with the dead-air space. The outer or front door is a double battened door, with an inner or sash door. A house of this kind, 12x18 feet, will accommodate about 300 colonies.

Mr. F. W. Comings gives the following description of a house which passed the ordeal of the winter of 1880-81 with the loss of but two, which succumbed from starvation: "The house is 12x18 feet, and studding ten feet. There being no cellar under it, we dug a trench about two feet deep, and laid a heavy stone wall in it. The sills were 6x14 inches. We then put up a set of 2x5 inch studs, and double-boarded the outside and sided up the inside, filling the wall with sawdust. Then put up a set of 1x2 inch studs against this wall and sided up; then another set of 2x5 inch studs and sided with matched spruce, filling the second wall with sawdust. Thus we have two five-inch stuffed walls, and an inch dead-air space between them. Overhead we put ten inches of sawdust, and studded the floor, using four inches for that. We use three doors in one end, in winter, making two dead-air spaces. Have ample ventilations in roof and floor."

WINTERING BEES IN CLAMPS.

Mr. M. Quinby favored wintering bees by burying, which is practiced by many at the present day. The mode is to dig a trench in a hillside or ground with sufficient slope to insure drainage. This is partly filled in with straw, on which the hives are placed; boards are slanted up in front; wooden tubes placed in position to ventilate the pit, straw thrown on the hives, over which boards are laid lengthwise, and dirt piled over all to turn off the water.

GENERAL ADVICE TO BEGINNERS.

Having already described a suitable location for an apiary, and indicated who should engage in the business, when to commence, what kind and how many colonies of bees to begin with, we offer the following advice to beginners:

GENERAL INFORMATION NECESSARY.

Obtain, at least, a general knowledge of the natural history of the honey bee, and of its management. Become acquainted, both theoretically and practically, with the use of improved apiarian implements. This can be obtained by studying a good manual for the apiary and bee periodicals, in connection with experience in the apiary. Spend some time with a practical and progressive apiarist, even if you have to pay for the privilege of "helping" him; for successful and prudent care of bees at all seasons and under varied circumstances, and the skill necessary to obtain the most honey in the best condition for the market, can be obtained only by practical experience in the apiary. From time immemorial bees have been kept by man, but until the past few years the pursuit has not received that attention that it demands. In this, as in all other departments of business, it is only the careful and practical that succeed. Nature has provided the health-giving delicious nectar in myriads of beautiful flowers, that deck forest, field and garden, and developed the bees to gather this abundant sweetness and store it in quantities far exceeding their wants—and man may step in to aid nature and bees, and utilize the surplus honey for his pleasure and sustenance.

SELECTING A LOCATION.

Locate where there is a profusion of white clover, with timber to the west and north, within range, where basswood or linden abounds; goldenrod, asters, Spanish needle and heartsease, or smartweed, abound in almost every locality,

and where they do not, it is easy and profitable to put in a few acres of buckwheat for late fall honey, as there is none better for wintering bees, and extracted buckwheat honey will always find a ready sale. In locating an apiary, avoid the close proximity of laurel thickets, as honey gathered from the laurel is unwholesome, if not really poisonous; avoid the neighborhood of cider mills, and do not locate immediately near a large body of water, as it will confine your bee-range to one direction exclusively. A broken or low country is no particular disparagement, because the less desirable for cultivation, the more encouragement will there be for you to take time by the forelock, and plant plentifully of such honey plants as will insure a constant bloom, and provide against the time when others, encouraged by your success, shall also commence bee-keeping in your neighborhood and over-stock the location, unless nature is liberally assisted. With all the above natural advantages secured, aided by your provident forethought in planting, you will have done much to settle the question as to the best method of wintering, and your bees, let them be of whatever color, will solve the problem as to which is the best race. We are often almost persuaded, that were more attention devoted to selecting a suitable location, and to providing continuous pasturage, there would be less cause for so much talk about procuring the best races of bees; the bees reared 'neath Italia's skies, would scarcely repay the expense of importing; no longer would we tread the shining sands of Syria in search of a better type; we could afford to respect the superstitions and avoid the scorching sun of Cyprus, for their bees would gather no more honey than our own; the bees of China would be left undisturbed in the shade of its historic wall; and those in Caucasus would still fly from flower to flower in their own native valleys. What though we possess a type of bees with the wings of a condor, with tongues as long as was that of Xantippe, and honey sacs with a carrying capacity equal to that of Falstaff, of what avail are they if there is no honey to gather?

PLAN FOR AN APIARY.

Decide upon a plan for an apiary, and then make it beautiful. Of all mankind, bee-keepers should admire the beautiful—and we really think they do. Italian, Cyprian,

Syrian and Albino bees are beautiful to look upon, and sip nectar from the loveliest flowers, hiding it in dainty cells of matchless beauty and virgin whiteness. What is there, in all Creation, so soul-inspiring as a cultivated garden of Nature's flowers, of variegated hues and heavenly grandeur? None but the unfortunate or despondent can fail to enjoy Nature in her garb of beauty, decked by the bounteous hand of Deity. To produce a garden of living gorgeousness we may all aspire, and long enjoy its gratifying results.

ADOPT A STANDARD FRAME.

Adopt one of the standard hives, and then scrupulously adhere to its use—for all the hives in one apiary should be alike, and the frames and all other parts interchangeable, in order to give the best results. Number conspicuously every hive—either with a stencil plate, or by painting large white figures on them.

KEEP AN APIARY REGISTER.

Obtain an *Apiary Register* from the office of the AMERICAN BEE JOURNAL, for at least one-hundred colonies; then you have room to add all swarms and keep the record all in one book. The two opposite pages are to be numbered to correspond with the number on the hive. This can be referred to instantly, and should contain a full history of the colony. By its careful and constant use your bees may be improved, their most valuable qualities developed, and the products of the apiary be greatly enlarged. Should a queen lack any desirable quality you will in this way soon discover it, and can supersede her. In this Register let all the important facts be noted, and by its complete history of each colony you may systematize all your work, lay it out in advance, save confusion, and inaugurate the best methods and management.

INCREASE BY DIVISION.

This is perhaps one of the most interesting features in the management of an apiary. All operations will be governed somewhat by the number of colonies to be manipulated, and the amount of increase desired; it should also be borne in mind that, although the amount of increase possible is almost unlimited, all excessive increase will be at the expense of the

surplus honey yield. In order to be better understood, we will suppose the apiarist has four good colonies which he wishes to increase to nineteen. As a progressive bee-keeper, he will be actuated by a desire to possess the best; therefore, the colony which has heretofore proven the most satisfactory in all things, will be selected as the one from which to rear queens for new colonies. This colony, for convenience in summarizing, we will designate No. 1. As soon as spring opens, feed No. 1 daily about half a pint of thin sugar syrup or honey, diluted with warm water. This had better be fed at the entrance in the evening, to avoid robbing, and be given slightly warmed. Keep this up till there is capped drone brood in some of the combs, or, better still, till you have drones emerging from the cells. Now move one of the other colonies from its stand (which we will designate No 2); place No. 2 on a new stand, put a new or empty hive on the stand vacated; lift the frame from No. 1 on which you find the queen and place in the empty hive (No. 3); place a frame of foundation in No. 1 and close the hive. From No. 2, and each of the two hives not numbered lift two frames of brood well advanced, shake off the old bees, and put the combs in No. 3, with the queen lately placed there. These last frames put in should be alternated as much as possible, so as to confuse the working bees from No. 2, which will naturally return to the old stand and enter No. 3. Fill up the latter hive with frames of foundation, alternated with the brood combs, to its full complement. If a ten-frame hive, this will give it seven frames of brood, three frames of foundation, and your best queen. If you have bright, clean, empty combs, they will answer about as well as foundation, though we prefer the best foundation. Put in foundation or combs to supply the places of those taken from the other hives, close them, and your first division is completed, making six colonies. In ten days, examine carefully the combs in No. 1, to see how many good queen cells (fig. 68) you have capped over. Close the hive carefully, and let it remain twenty-four to thirty-six hours. As soon as you have determined the number of cells, remove each of the four colonies, which have queens, to new stands, and place empty hives where they stood. Take the brood frame from each on which you will find the queen, and place in the empty hive where they were moved from. Add

three more brood frames to each, from the hive removed from there, place two frames of foundation or empty combs in the center of these, put a division-board on the outside of the combs, and close the hives. The hives from which these were taken will each be left with six brood frames; to these add two empty combs or sheets of foundation, put in division boards at the outsides, and close for twenty-four or thirty-six hours. You now have four new colonies with queens, four without queens, and one with queen cells.

At the end of twenty-four hours you will find queen cells started, or preparations to start them, in the four queenless

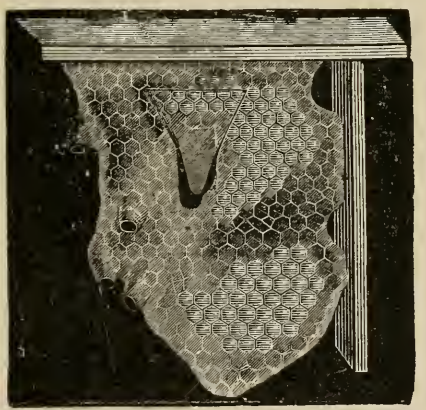


FIG. 108.—*Brood Comb with Queen Cell Engrafted.*

colonies. With a sharp, narrow-bladed knife, cut out four of the best queen cells from No. 1, leaving a good one; cut a triangular hole, about one-and-a-half inches across, from the center of a brood frame in each of the queenless colonies, and slip in a queen cell. These should fit pretty tightly, so they will not drop out (fig. 108). Observe great care not to bruise any of them, and they must not be cut so close to the cell as to run a chance of injuring the young queen yet in the cell. In a few days these young queens will be hatched, mated and laying, and you now have nine colonies. As fast as the foundation in these colonies is drawn out, the comb can be spread and new foundation or combs added, until the full

complement are in the hive, when a new colony may be formed, in the same manner as at the start, and the original queen from No. 1 can be put in this, leaving her colony queenless to build queen cells. In ten days repeat the operation of dividing as before, and in twenty-four hours insert queen cells, foundation, and division boards as before. You will now have nineteen colonies from the four in early spring, and by close attention in supplying good foundation as fast as they are prepared to receive it, with a good white clover and basswood yield, or a few acres of sweet clover pasture, you may expect a fine surplus yield of extracted honey.

If indifferent to the amount of honey, with an average fair season, another division can be made with safety, and your four colonies will have been increased to thirty-seven. If more than four colonies in spring, divisions can be made oftener by alternating the best queen between two colonies, in order to keep a supply of ripe queen cells always on hand, or, better still, keeping nuclei with laying queens, to supply as fast as divisions are made.

SWARMING.

Several methods of artificial swarming can be practiced with success, either of which we think preferable to natural swarming, which is always to be avoided where possible, as it occurs just at the season when least desired. If the bees, as is sometimes the case, are in box hives, the English method of drumming up is among the most feasible, and is executed as follows: Select some bright, clear day, when the workers are busily engaged in the fields, remove the hive ten to twenty feet from the stand, and put in its stead a frame hive, with half or two-thirds its complement of frames filled with bright, clean combs, or good foundation and division boards at the sides; turn the old hive bottom up, and invert an empty box over the open end; now blow in a little smoke from the lower end of the hive, and commence a series of sharp drumming or rapping on the sides of the hive with a small hammer or stick; do not drum hard enough to loosen the combs or start them to dripping; after rapping four or five minutes, cease for a minute, then resume again, and keep it up for five minutes longer, or until the bees have

deserted the hive and clustered in the box, which is a pretty sure indication the queen is with them. Now cover a sheet over the old hive, and empty the bees from the box on a sheet in front of the new hive on the old stand; watch them as they crawl up, to discover the queen; if she goes in, place the old box on a new stand, and your work is accomplished.

If the bees to be operated with are in frame hives, remove the old hive to a distance, and place a new or empty one on the old stand, when the bees are working busiest; lift the comb on which you find the queen from the old hive, destroy queen cells on it, if any, and place in the center of the new one, with the queen; fill in frames each side, filled with clean combs or foundation, proportionate to the strength of the colony, and confine to the center of the hive with division boards; put on the blanket and hive cover; now take the frames one at a time from the old hive, and shake most of the bees off in front of the new hive, destroy all the queen cells in the old hive but the two best, or give them a laying queen after destroying or removing all the cells; put in an empty comb or frame of foundation in place of the one removed to the new hive, spread the blanket over, or put on second story with sections or extracting combs, and place the hive on a new stand, well removed from the old one.

Another method which can be practiced with good results, is to examine the colony threatening to swarm, remove all queen cells started, then remove the hive to the stand occupied by a very weak colony, and remove the weak colony to the stand formerly occupied by the strong one.

In all cases where foundation or empty combs and division boards are used in dividing or artificial swarming, care must be used to spread the brood chamber and give additional combs or foundation as fast as the bees are ready for it. It is more profitable to melt up dirty combs, or those with dead brood, and use instead good foundation. If there is a doubt about the combs, give the foundation the preference.

PREPARING FEED FOR VARIOUS PURPOSES.

If for spring stimulation to breeding, use sugar, honey and water, prepared in the following manner: Coffee A sugar, one pound; good honey, one pound; boiling water, one-and-a-half pints—simmer on the stove five minutes, and feed at

the entrance in the evening, about half a pound per colony, slightly warming it; or, if no other bees in the neighborhood, it can be given in shallow pans, and placed in the noon-day sun, at some distance from the bees.

For feed during the inclement weather of May, when the hives are full of young bees and brood, and no honey coming in, one pound of coffee A sugar or one pound of honey, and one pint of boiling water, simmer five minutes.

For feeding in fall for winter stores, three pounds of coffee A sugar and one pint of boiling water, simmer five minutes. Feed this inside the hive with a division board feeder, or in a tin can with a coarse cloth tied over it, and inverted on the frames. For fall feeding, estimate the amount required, and give it as fast as the bees can store it in the combs.

For winter feeding, use four parts coffee A sugar and one part water; simmer till it becomes quite hard on being cooled, mould into frames of one inch thickness, and lay it on top the frames, using sticks underneath one-half inch square; or mould it in brood frames, tie hemp twine around to hold it in place, and put in center of the brood chamber.

GUARD AGAINST OVER-STOCKING.

The illustrious Rev. L. L. Langstroth adopted the maxim, "*Keep all colonies strong*," as his watchword. We supplement this by advising to provide a continual honey flow, when your colonies *will always be strong*. As fast as you increase your apiary, plant or scatter an additional pound of self-propagating seeds for each new colony, which will provide good honey-secreting bloom. With an expenditure of say thirty cents per colony, as fast as increased, in well-selected seeds, judiciously sown, you need borrow no trouble about feeding, though you increase to five hundred colonies.

PROVIDE CONTINUAL HONEY BLOOM BY PLANTING.

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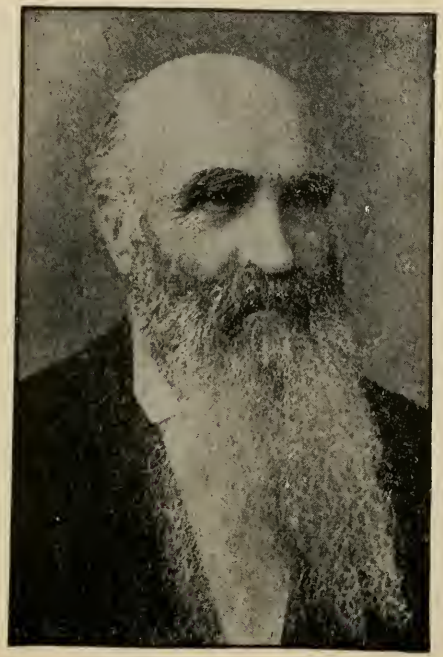

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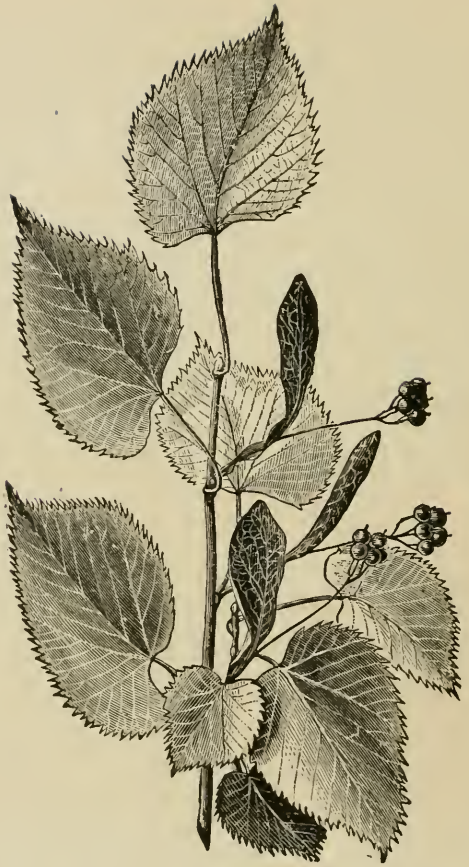

The BASSWOOD or LINDEN, (Tilia Americana).

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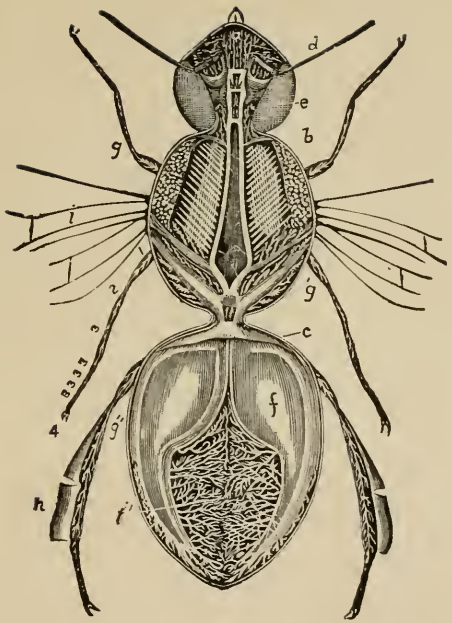

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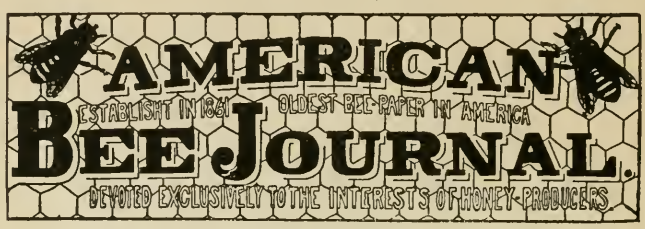

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